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WAR AND NIGHT BLINDNESS.

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BRUSSELS, BELGIUM.

The author serving as Reserve Surgeon in the Belgian Army in the Field, reports his own experience covering the period from October, 1915, to February, 1918, gives an account of the conditions probably producing night blindness and its simulation, with discussion of causes, especially disturbance of the intraocular circulation.

The night blindness of soldiers continues to be a real problem on the Belgian front. At the beginning of the year 1916 Weekers (Archives d'Ophtalmologie, v. 35, p. 73), had described numerous cases which had presented themselves from January to October, 1915. At the latter date the consultations in ophthalmology were established in the hospitals of each division of the army.

Among 2,700 patients who presented themselves during a period of 29 months at the office for consultations, of the division to which the writer is attached, 203 complained of not seeing at night. Night vision, always difficult to soldiers free from ocular defects, was to them more difficult, if not impossible. They were afraid of falling into the trenches or shell holes, of missing the foot bridges as they reached them. They were exposed to great risk at night unless guided by obliging comrades.

These 203 cases presented themselves as follows:

1915.		July	1
October	1	August	8
November	8	September	4
December	5	October	5
1916.		November	11
January	7	December	5
February	4	1917.	
March	1	January	13
April	5	February	7
May	19	March	6
June	6	April	2
May	6	November	7
June	16	December	33
July	5		
August	–	1918	
September	1	January	12
October	1	February	4

Most of these men were from the ranks, only two being officers. From the point of view of refraction these 203 cases were divided as follows:

Emmetropes 66, two having corneal scars.

Hyperopes less than 1 D., 14.

Hyperopes 1 D. and more, 50, of whom one had corneal scars.

Astigmic hyperopes, 20, one with lenticular opacities.

Myopes, 31 (two cases of retinitis pigmentosa).

Astigmic myopes, 16.

Having mixed astigmia, 4.

We exclude from our statistics the 2 cases of retinitis pigmentosa which cannot be considered as night blindness of war. At the beginning of November, 1917, I made an investigation of the sincerity of those reporting hemeralopia. Among 27 cases regarding which responses were obtained from the commandants of the companies, the diagnosis of hemeralopia was confirmed in 18 cases, and 9 cases were clearly chargeable to simulation. I count equally among simulators the men lacking in sincerity in claiming diminished visual acuity by daylight,

and detected in falsehood by tests for simulation. Among these I find 11 cases. I also count as simulators 2 cases, who claimed hemeralopia but who also presented a provoked conjunctivitis.

It is certain that I have not excluded all the simulators, and that a certain number have passed unperceived. Neither must we neglect those other factors of error, the exaggerators—the simulators, sincere and partly sincere. The soldier exaggerating the accidental occurrences of war does not hesitate to transform a slight difficulty of night adaptation into almost total blindness.

I have had occasion to reexamine a large number of hemeralopes. Among them 22 were said to be completely cured, some by wearing of glasses, some by internal treatment with arsenic and strychnia, and others simply by rest.

Among 86 men I have questioned on the beginning of their affection, 23 claimed to have been attacked before the war; but 63 had done satisfactorily their night service during a part of the campaign, and had been attacked by night blindness only subsequently.

I believe we can class the hemeralopes that I have examined in the following manner:

1. Hemeralopia with retinal lesions.
2. Hemeralopias of congenital origin.
3. Optical hemeralopia, (by errors of refraction uncorrected, by clouding of the media).
4. Hemeralopia without lesions (essential). Corrected errors of refraction. Emmetropia.
5. Exaggerators and simulators.

The hemeralopia of patients attacked with pigmentary chorioretinitis is a constant symptom, showing itself in the case of sclerosis of the retinal and choroidal vessels of syphilitic origin, and going on to secondary atrophy of the chorio-capillaris and external layers of the retina.

For explanation of congenital hemeralopia Truc suggests a deficiency in the rods or in the visual purple; and that congenital night blindness can have passed unperceived in soldiers who were affected. It required long duty in darkness rendered necessary by war, to make them discover a defect in adaptation, which their previous life had never caused them to notice.

The cloudiness of the transparent media (scars and opacities) hinders the entrance of the light rays into the eye, diminishing the acuteness of day vision, and is a good reason the men affected should have a night vision inferior to that of a normal man. The myope, like the uncorrected astigmic, having an inferior visual acuity by day, it is evident that his vision is likewise diminished at night.

Walking myself in the evening in the unlighted cantonments at the front on a dark night, wearing strong convex lenses, the difficulty experienced was very great. I was obliged to take the arm of my companion, on the way that I knew perfectly; and I encountered obstacles, not even suspected. The experience is easy to try. The defective vision, accentuated with the myope during darkness, by enlargement of the pupil, diminishes further the clearness of the retinal images.

Landolt recognizes several causes of hemeralopia in corrected myopes.

1. With equal pupils in the corrected myope the retinal image is less brilliant than in the emmetrope.
2. Wearing of correcting glasses renders the image more clear, but less luminous. The correcting glass reflects a part of the light, and the point of reflection interferes with the sight.
3. The light at night furnishes a predominance of blue rays, the most refrangible, which give a focus more in front of the retina than do the other radiations.
4. A last cause, indicated equally by Magitot, is the effect of elongation of the myopic eye on the ocular membranes, and particularly on the vessels and pigment epithelium. In the hemeralope without lesions, but with an error of refraction corrected, Landolt has never encountered hyperopes. We, on the contrary, have encountered a large number of hyperopes, of which

several were confirmed after minute prolonged investigation.

What are the general causes which may produce this condition?

Without going into the details of the daily ration of the Belgian soldier, we know by calculation, based on the energy value of 3,100 calories, it constitutes a sufficient food to make good the loss occasioned by the labors of war. Theoretically fresh legumes are insufficient, but during most of the campaign, at one meal daily, potatoes, a food which may be eaten daily, replaced the legumes.

The habitual beverage of the Belgian soldier is coffee, weak enough to be free from toxic influence. Alcohol is completely prohibited on the Belgian front. Acute alcoholism through beer is a rare exception.

The soldiers smoke enormously, but tobacco amblyopia never produces nyctalopia. In our cases of hemeralopia we have not found central scotoma. In hemeralopia from malnutrition or cachexia, we know, there frequently exist spots of xerosis, called spots of Bitot, on the conjunctiva. We have never encountered these among our patients.

Weekers remarks, very justly, that the Belgian soldier is healthy; his age is a factor for health, and the race is robust. Arteriosclerosis is rare. Nevertheless with the long duration of the campaign causing fatigue and depression, it is a fact that while the outward appearance of the men is that of normal health, they present an irritability of the cardiac muscles under excitement. When in repose it is normal. However, when the men march, for one-half hour for example with their complete equipment (35 kilograms, 77 pounds), it frequently causes tachycardia.

If we review the causes of physical overwork, the violent moral and emotional disturbances of war, and the severe fatigue, it is evident these must be reflected in the function of the heart muscle. These temporary disturbances of circulation by cardiac fatigue must be represented in the functioning of the choriocapillaris, affecting the delicate pigment epithelium of the retina and the secretion of the visual purple.

I have said above that hemeralopia belongs almost exclusively to the foot soldier. To reach the trenches he must go, often several leagues, on foot with his complete equipment; and in the trenches his emotions are violent and sleep limited, so that the cardiac fatigue is greater. In the bad sectors the causes of fatigue and emotion are increased, and constantly the number of cases of true hemeralopia will naturally be increased. Again the number of malingerers here encountered would be greater.

In my opinion the causes indicated by Weekers, overwork and nervous exhaustion, are the real factors in hemeralopia. But I am led to believe that the immediate exciting cause is circulatory disturbance of the choriocapillaris.

The means of investigation which are at our disposal at the front are quite limited; the occupation of the country, always provisional and transient, does not permit of tests with the adaptometer, nor even to test conclusively the light sense. I have in a systematic manner sought the lesions described by Sexe, Augstein and Jess; with all my consultants; but am not able to draw from them diagnostic conclusions.

Perimetry has shown in the majority of cases of confirmed hemeralopia a diminished field for colors, contraction of the periphery for green. I have, however, also recorded the visual field as normal. I have never encountered contraction of the visual field below, described as characteristic by Wolffberg. The method with smoked glasses, proposed by Cantonnet, has given no more result for confirmed hemeralopia. The men admit no greater diminution of visual acuity when furnished with smoked glasses, than do normal men subjected to the test.

The practical means available at the front for such an investigation are: the inspection of the men, and their observation by the commander of the company; these being naturally care-

ful and prolonged. For treatment we have the exact correction of errors of refraction, attention to the underlying condition, treatment of conjunctivitis and keratitis, which often accompany hemeralopia.

Attention to internal remedies as the giving of extract of liver, cod-liver oil, or calcium lactat. Arsenic, iron and strychnin sometimes give encouraging results. In severe cases rest for several days may be indicated.

The management of this condition at the front should recognize:

1. Hemeralopia accompanying retinal lesions is incompatible with service in the army; the patient should be sent to the rear.

2. In other cases a minute inquiry is necessary. If existence of hemeralopia is confirmed, the soldier must be excluded from isolated night duty, as sentinel, patrol, signal-man, or observer in small posts. He must remain for the time with the bulk of his company. If, however, in the end he becomes too great a hindrance, he should be retired. The simulator must suffer the necessary penalties.

In brief: The hemeralopia of soldiers is a well established affection. The night life of the soldier brings to light a certain number of cases of congenital night blindness. Errors of refraction and clouding of the transparent media can be considered as causes of hemeralopia. The excessive strain, physical and moral, occasioned by war has produced cases of real hemeralopia, by bringing about circulatory disturbance in the choriocapillaris, causing a defect in the mechanism of retinal adaptation.

WHIP-CRACKER INJURY OF THE EYE.

With a Report of Three Cases.

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Attention is here called to an unusual and puzzling form of ocular injury, and to a defect in the diagrams used in the localization of foreign bodies shown in X-ray pictures. This paper was read before the American Academy of Ophthalmology and Oto-Laryngology, October 30th, 1917.

It has been a task to attempt adequately to express in the title of this communication its real meaning; whip-cracker injury does not express it, for the end of the whip or cracker did not come in contact with the eye. The real trauma was inflicted by a flying bit of fine brass wire which was plaited or braided into the end of the whip, or what is commonly called the cracker. At first thought it is almost inconceivable how a bit of fine wire No. 31 gauge, could penetrate into the eyeball or actually traverse the entire length of an eyeball and lodge in the posterior sclera, but nevertheless this has been demonstrated by the cases to be reported.

The whip generally used by teamsters has a long lash so that in swinging the whip it is not unlike the long arm of a lever, the velocity which the end or cracker acquires and the distance which it travels is greatly augmented and limited only by the length of the lash and the force with which it is hurled. After giving the subject of velocity some thought and endeavoring to calculate the velocity of the end of a whip, after a vigorous crack, the writer feels that he is not exaggerating in the least when he

states that the ultimate velocity of the cracker is certainly more than 1,000 feet per second and perhaps nearer 10,000 feet per second. Some idea of this apparently immense velocity may be visualized when we stop to think that sound travels at the rate of about 1,100 feet per second.

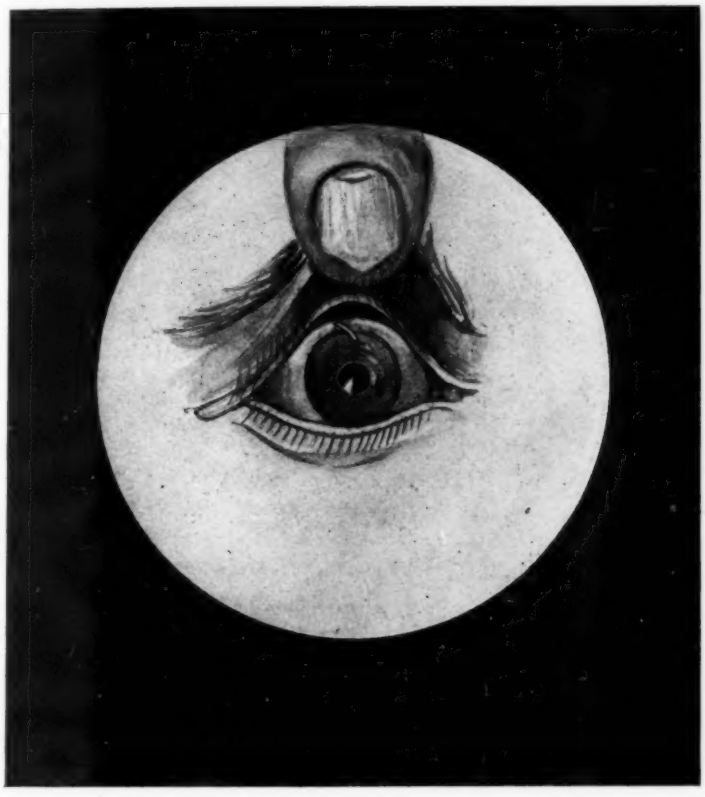

Fig. 1. Drawing showing wire in eyeball of case one.

It has been the good fortune of the writer to see three cases the result of a flying bit of brass wire from the end or cracker of a whip. The first case was simple but paved the way for the recognition of the next two cases.

REPORT OF CASES.

CASE 1. July 13, 1910, K. K., aged 27, consulted the writer about his right eye. He stated that while driving his horse and using his whip on the previous day a bit of something from the end of his whip flew into his right eye. Examination showed that the right eye had a bit of something protruding from the cornea at the limbus at the vertical meridian above, but still within the clear area of the cornea. A closer inspection showed the other end, which apparently was a piece of wire, in the anterior chamber. The foreign body was removed and proved to be a piece of brass wire, No. 31 gauge, 7 mm. long. The eye made an uneventful recovery.

CASE 2.—Dec. 4, 1915, M. R., aged 23, consulted the writer about his left eye which, he stated, had been injured by a piece of brass wire from the end of a whip on Nov. 30, 1915. He had been under observation and treatment from that date by some one near his home. Examination showed that an iridectomy had been done. The lens mass was still clear, the vitreous was cloudy, with no fundus

reflex, and vision reduced to light perception. Having in mind the experience of Case 1 and O. W. Holmes' saying, "Never to guess when it is possible to know," a roentgenogram was immediately ordered to determine the presence of a foreign body. Dr. George C. Johnston made the roentgenogram and reported positive findings of what appeared to be a piece of fine wire, 5 mm. long and exactly similar to the piece removed from the eye in Case 1. The roentgenogram showed this foreign body to be a piece of wire and to be located in the posterior part of the vitreous. In view of the condition of the eye and the impossibility of the safe removal of the foreign body, an enucleation of the eyeball was advised. The patient, however, refused, signed a release and left the hospital.

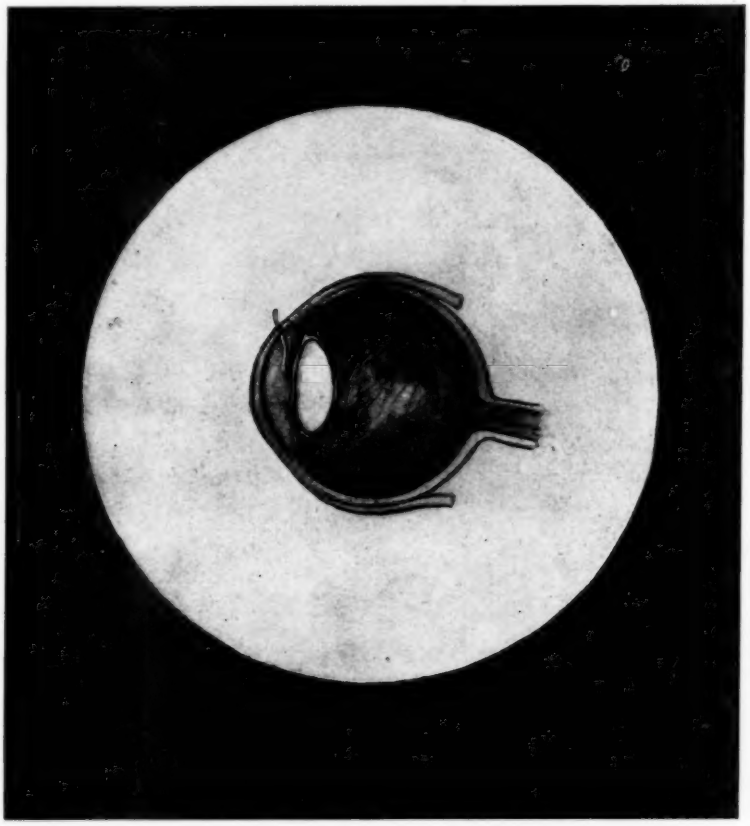

Fig. 2. Drawing showing wire in eye ball (cross section) case one.

CASE 3.—L. A. D., aged 28, consulted the writer Jan. 18, 1916, with the following history: He had had his right eye injured by a piece of something flying from the cracker of a whip in the fall of 1910. His eye was treated at that time, became quiet and remained so until July, 1914, when it again became "sore and painful." The vision by this time had been reduced to light perception. He had his eye treated at this time and it became quiet until December, 1915, when he consulted some one who suggested the removal of the cataractous lens, which the patient, however, refused to have done. When he was seen, Jan. 18, 1916, examination showed the right

eye quite pale, and no ciliary injection; cornea, clear; the pupil contracted and fixed; the lens mass opaque.

Having in mind the experience of Cases 1 and 2 a roentgenogram was immediately ordered, which was made by Dr. George C. Johnston, with positive findings. The roentgenogram showed a foreign body (as per diagram) apparently a piece of wire about 5 mm. long and apparently the same gauge as that found in Cases 1 and 2. Localization showed this foreign body just outside of the posterior sclera. Enucleation was advised and done a few days later.

Immediately after the enucleation a search was made in the orbit for the foreign body but none was found. On examination of the enucleated eyeball, however, a dark spot was observed on the sclera at about the posterior pole, which looked very much like a bit of fine wire. This was cut into with a small knife and was suspected to be the bit of wire. The enucleated eyeball was sent to the laboratory of Dr. George C. Johnston without any history or comment whatever, but with the simple request that a roentgenogram of the enucleated eyeball be made.

These roentgenograms showed a bit

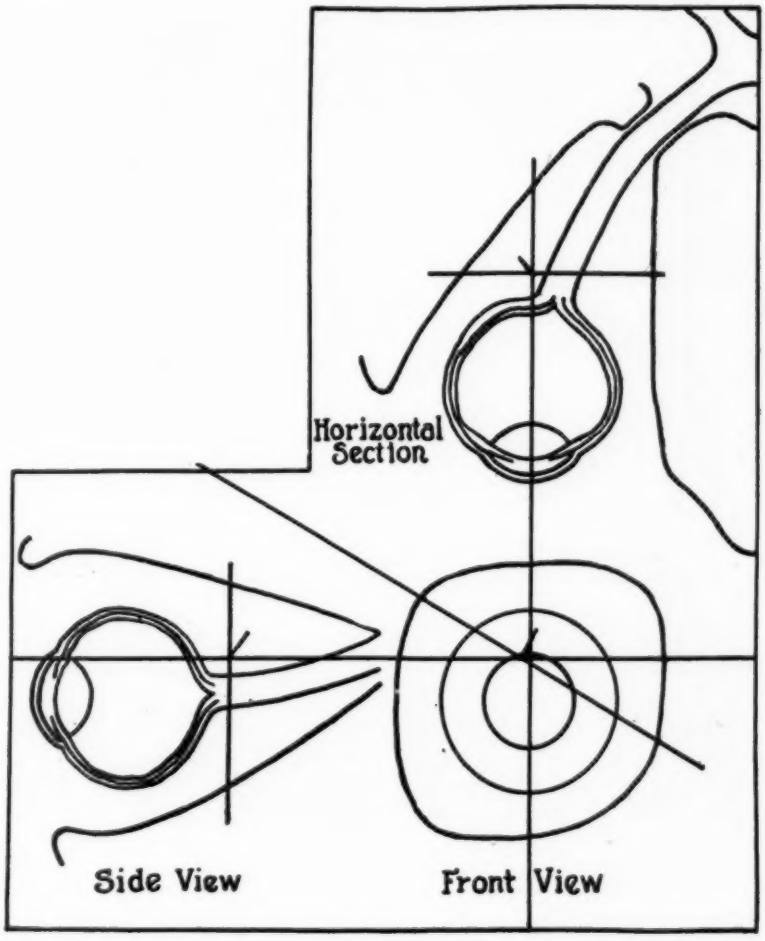

Fig. 3. Diagram showing localization of foreign body in the orbit back of eye ball in case 3.

of fine, No. 31 gauge, wire located in the posterior sclera at the suspected point. Thus demonstrating conclusively the premises and proving the immense penetrating power of so fine a bit of wire for so great a distance.

scarcely probable that these individuals supplied the brass wire themselves, as Case 1 was a resident of Pittsburgh, and Case 2 was a resident of Clarion County, Pa., and Case 3 was a resident of northern Allegheny County.

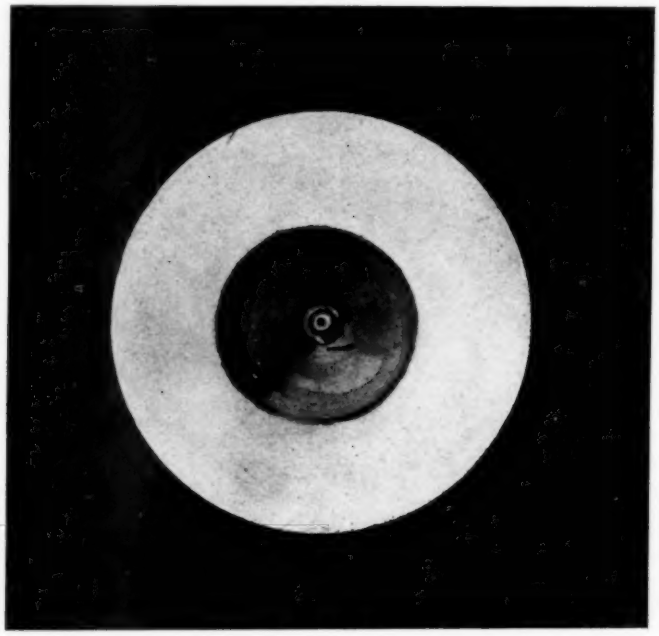

Fig. 4.—Drawing of the posterior view of enucleated eyeball showing the wire imbedded in the sclera, near the entrance of the optic nerve, case No. 3.

The writer has had several of these what might be called border line cases, in which a foreign body was localized at a point where it was impossible to tell accurately whether the foreign body was within or without the limits of the eyeball, so that he feels that the diagrams in use show the eyeball to be perhaps one or two mm. too small in diameter. This has been impressed so strongly on the mind of the writer that he anticipates making this a study for a separate and future communication.

The writer has made some inquiry from dealers in whips and he has learned that it is not a common practice to incorporate brass wire in the cracker of a whip. But that some whips are made this way, there can be no doubt as illustrated by the three cases recited. It is

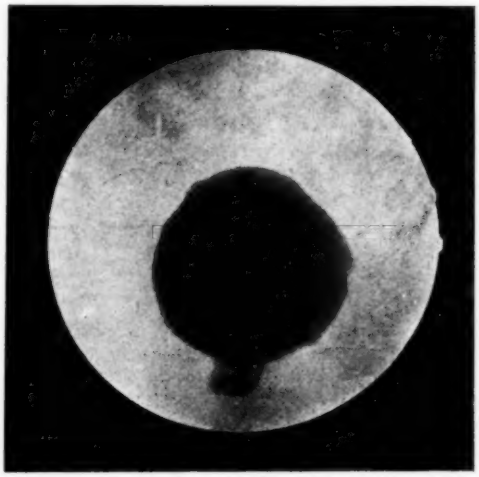

Fig. 5. Roentgenogram of enucleated eyeball, showing the wire near optic nerve. Case No. 3. (The enucleated eyeball and X-Ray plate were shown at the meeting.)

CONCOMITANT MOVEMENTS, ESPECIALLY OF THE UPPER EYELID, WITH SUCTION.

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This paper gives a survey of the physiologic typical associated movements of the eyes and lids, and of physiologic atypical, and pathologic, concomitant movements in general. It discusses the paradoxic movements of the upper lid with mastication and suction, with report of an illustrative case, presenting the different views of explanation of these phenomena, with consideration of anatomic and physiologic researches and clinical observations. Read before the Milwaukee Medical Society April 23, 1918.

Concomitant or associated movements are movements which occur against, or at least without, our will, simultaneously with intended voluntary movements. They may be physiologic or pathologic. The physiologic associated movements follow either constant laws and are typical, or are entirely incoherent and show individual differences. The positions and motions of both eyes, by their mechanism of innervation, are so intercombined that they can never be executed independently, but only in certain combinations or associations, and partly with certain other movements.

According to Hering's law of equal innervation, both eyes, with regard to their movements subservient to the visual sense, are used as a single organ. For the moving will power it is irrelevant that this organ in reality consists of two different parts, because it is not necessary for the will to move and govern each of these parts separately, since one and the same impulse directs both eyes simultaneously just as a team can be guided by single reins. These associated movements of both eyes are binocular elevation and depression, the binocular lateral movements and the combinations of both these movements in oblique planes, and convergence and divergence of both eyes. Further, associated innervations for rotations, association of convergence with accommodation and width of pupils, and the less fixed movements of the eyeballs with those of the lids and the head.

These associated movements of the eyes are so constant, that they also take place independently of the purpose of seeing, e. g. in an eye that has been covered up, or a blind eye, and also in children born blind.[1] Their impulse persists even in ocular palsies leading to double images which could be avoided by separated fixation of each eye. Most ocular movements of new born children are associated, although they occasionally show also incoordinated movements like adults when half asleep. As expressed by Hering, the motor correspondence of the retinas has its motor correlation in the correspondence of the movements produced by the association. The movements of the eye are elicited by the psychophisic process of direction of attention, and are executed under the control of the retinal images.

Their association results from a number of anatomic conditions, viz.: The cortical communications through the crossed radiating fibers, the connections of the homolateral nuclei through the dorsal longitudinal fascicle, the transverse connections of the paired nuclei, the partial crossing of the oculomotor nerve and the total crossing of the 4th nerve. The constancy of the origin and termination of the systems of fibers insures the constancy of the chief types of associated ocular movements and explains the physiologic range of limited variability of certain associations under conditions artificially created.

The physiologic proof of the existence of the transverse connection of the homonymous nuclei of the ocular nerves has been furnished by Bernheimer in the monkey[2]. After separation of the paired nuclear region by a median section, the synergic ocular

movements cannot be performed, but the animal moves his eyes irregularly, each for itself, independently of the other.[1]

The associated movements of the upper lid and the eyeball are elevation of the lid by contraction of the levator palpebrae, with the moving of the eye upwards by contraction of the superior rectus, and depression of the lid with the downward motion of the eye. This synergy of the levator palpebrae and superior rectus rests on anatomic conditions. The space between these muscles is filled by a bundle of fascia which connects both so firmly, that, aside from the action of the levator, also a contraction of the rectus will effect a raising of the lid (Merkel). Both muscles are supplied by the upper branch of the oculomotor nerve, and the nuclei for the innervation of both lie so near together, that a sharp differentiation of their borders is not possible. Therefore it is not unlikely that a stimulation of the nucleus of the superior rectus may, on preformed anatomic paths, entail also a corresponding excitation of the nucleus of the levator. The tonus of the levator keeps the palpebral fissure open.

A participation in the elevation of the upper lid has also been ascribed to the smooth fibers of the tarsalis superior muscle and, von Graefe's symptom in Graves' disease, viz., the lagging behind of the upper lid in looking downward has been explained by a spastic contraction of this muscle. According to Sattler's investigations, however, the function of the tarsalis muscle consists simply in keeping the lids in close contact with the eyeball in all its movements and positions. Its supposed contraction in other morbid conditions, in which abnormal contractions or spasms of the upper lid are encountered, is not very probable, since most of these conditions are complicated by other disturbances in the innervation of the oculomotor nerve.

The depression of the upper lid is partly due to contraction of the palpebral portion of the orbicularis muscle, to relaxation of the levator, to gravitation, and to the anatomic connection with the superior rectus which carries the lid along with the downward movement of the eye. If this connection is very loose, the eyeball moves down first and the lid follows. Blaschek[3] found in a group of normal individuals in adduction of the eyeballs elevation, and in abduction depression of the upper lid, as physiologic concomitant movements, and in another group the opposite behavior. Beer[4] maintains that there exists a constant physiologic synergy between the muscles of mastication and of the tongue on the one hand, and the ocular muscles on the other. On lateral movements of the eyes the muscles of mastication of the same side contract and the tongue deviates to this side. Vice versa the eyes move a little on voluntary movements of the muscles of mastication and of the tongue.

Certain pathologic cases of nuclear palsies, reported by Wilbrand and Saenger might suggest the existence of a center of association for the superior rectus, inferior oblique, and levator; the accidental combination of diseased nuclei giving the appearance of a paralysis of a supposed association center. The authors, however, consider the assumption of such a center superfluous, because, as for reasons of expediency from earliest infancy the upper lid has been raised in looking upward, the common innervation of the elevators of the eye and the levator has become habitual with mankind, just as the simultaneous innervation of the internal recti and the muscle of accommodation in near vision.

Numerous instances of physiologic inconstant or atypical concomitant movements, can be mentioned. A new born child brings a multitude of muscles into activity, of which only a few would suffice if a localization of the impulse for appropriate motions were developed. The same occurs in adults in the attempt of contracting rarely used muscles, or in learning certain physical achievements. If one tries to move one's ears, one generally will contract, aside from the auricular muscles, also the muscles of the scalp or the face. In attempting to raise or lower the wings

of the nose he will wrinkle his forehead or close his eyes. Children, or persons with inflamed eyes and photophobia, who have no control over their muscles, when asked to open their eyes, can do this only if they open their mouths, perhaps with the purpose of exerting a traction on the lower lid by the downward movement of the skin of the upper lip, or contract the frontalis muscle for helping to raise the upper lid[5]. At present I have a patient who habitually contracts the wings of the nose with each blinking movement. Topolanski[6] observed in a large number of cases with each contraction of the orbicularis a simultaneous contraction of the wing of the nose.

The beginner at the violin, or other musical instruments, at singing, dancing, riding, or other gymnastics, accompanies the required movements with numerous superfluous concomitant motions, until sufficient training enables him to suppress these. Their absolute exclusion is the characteristic of the accomplished athlete, acrobat, or virtuoso, and indeed the absence of gestures is an attribute of the educated gentleman.

Also in ordinary movements concomitant contractions of muscles or groups of muscles may be observed, if carried out with intense exertion, as contortion of the face, in lifting heavy weights, the participation of the muscles of the forearm and finally of the upper arm in pressing an object very hard with the thumb, or the contraction of the tensor tympani during forced compression of the jaws by the muscles of mastication. The cause of all these concomitant motions is generally ascribed to irradiation of the motor impulse in the grey substance of the central nervous system, in the cerebral cortex or in the medulla or spinal cord.

In pathologic conditions it is not rare that the hemiplegic limbs are moved simultaneously with active motions of the muscles of the healthy side, or in yawning, coughing, sneezing, etc., that the paralyzed hand contracts to a fist with shaking of the healthy hand, or the closed hand opens on yawning. Also the opposite occurs, that the active movements of the formerly paralyzed and still paretic muscles, or the attempt of contracting them is accompanied by corresponding movements of the muscles of the healthy side.[7] Hereditary compulsory concomitant movements of the muscles of one extremity on innervation of the symmetrical muscles of the other have been described, in which e. g. the left hand simultaneously imitated the movements of the right hand.

These cases are in accordance with experiments of stimulation of the motor cortical areas by Hitzig, in which, added to the contralateral movements, movements of the extremities of the stimulated side also occurred. François-Franck, Pitres, and Lewaschew proved that the homolateral movements resulted, not from direct homolateral conduction, but through crossed paths and transverse conduction in the spinal cord, e. g. after a section through the right half of the dorsal cord on stimulation of the right cortex the bilateral reaction of the lower extremity remained.[8]

A great variety of paradoxic concomitant movements of the eyelids have been observed, which occur against the general rule of lid movements, and are not to be expected even under pathologic conditions. They are associated with movements of the eyeball or with other groups of muscles. The most peculiar of these is the syndrome of one sided involuntary raising of the upper lid with the innervation of the muscles of the lower jaw, tongue, pharynx and face. About 87 cases have been reported since Marcus Gunn, in 1883, first demonstrated one before the ophthalmological society in London.[9] This condition is called in France "Mâchoire à clignements" and in England "jaw winking."

With few exceptions the affection was congenital and stationary. In a few it seemed to have developed through a cerebral disease. In a few the symptoms became less marked or subsided entirely. In others they became more intense, so that the prognosis must be guarded. In the majority, e. g. in 58 out of 71 cases, collected by Bielschowsky,[10] the upper lid showed more or less congenital ptosis, which was absent in

9; other congenital ocular palsies in 17, most frequently of the superior rectus (in 13 cases). The lifting of one upper lid most commonly occurred on opening the mouth in speaking, in singing and chewing, and more intensely on lowering the jaw, or moving it to the opposite side, which is done by the homolateral external pterygoid muscle, or both; in a case of Friedenwald[11] also to the same side, in others in swallowing or blowing the cheeks.

CASE.

Last November I observed the following case: A boy, aged 8 months, when drinking out of the bottle and looking down at it, raised his right upper lid synchronously with each suction movement, so that the upper part of the sclera became visible. The same movements, although not as intense, were observed when he ate a cracker, while looking down. The upper lid of the left eye remained in its natural position. The movement of the lid ceased, as soon as he stopped drinking, and returned with its resumption. When his attention was attracted by an object held before him and this was moved upwards, so that he followed it with his eyes upwards, the movement of the upper lid was arrested, while he continued drinking.

The eyes and lids showed no changes, especially no paralysis, had normal positions, and the palpebral fissures were of equal and normal widths. The child was under treatment of Dr. Kastner for a gastro-intestinal affection, and had a mild otitis media which promptly healed after paracentesis. But the above described phenomenon persisted after subsidence of his digestive trouble, and was unchanged when seen 3 months later.

The case was a very good example of congenital concomitant movement of the right upper lid with that of the muscles enacting the suction process. These are the muscles of the mouth, supplied by the facial nerve, and of the tongue, especially the genioglossus, and those which draw the lower jaw backwards and downwards, the geniohyoid, all supplied by the hypoglossal nerve, the mylohyoid and anterior part of the digastric, supplied by the third branch of the fifth nerve, the posterior part of the digastric by the facial nerve. The center of suction lies in the nuclei of these nerves.

I found in literature only 3 similar cases. In one of Grimsdale,[12] the paralyzed upper lid was raised and the eyeball retracted simultaneously with the suction movements of the child.

A case of Cockayne,[13] occurred in a healthy looking girl, aged 6 months. The movements were first noticed when she was about a month old. Voluntary movement of the levator was good, and also of the other ocular muscles, pupils equal, reacted to light, no facial asymmetry. As the baby sucked at the breast, the right lid, which showed slight ptosis, was raised synchronously with the movements of the jaw, so that a little sclerotic was shown above the cornea. As the jaw was moved away from the side of the lesion, as in grinding the teeth, the lid was raised. An almost imperceptible lateral movement was sufficient. The left lid was not moved, and the right eye itself remained stationary. Slight sucking movements produced no movement of the lid. When the baby yawned or laughed, the lid was retracted to an extreme degree and showed a large extent of sclerotic. The movements were diminishing in frequency and in extent.

Sym[14] observed in a woman, aged 30, affected with ptosis, that especially in chewing and sucking the upper lip moved far upwards, so that the upper part of the sclera became visible.

For the explanation of this abnormal association between the muscles of the lower jaw and the levator, a number of theories have been advanced. Some authors, e.g. Blaschek, consider it as a concomitant movement, that may occur physiologically and in some cases assume an unusual intensity. Lutz[15] maintains that the phenomenon cannot be interpreted as an abnormally intense physiologic, but rather as a pathologic, concomitant movement in the sense of Oppenheim, on the order of those mentioned above. It certainly is not a typical physiologic concomitant movement, and the inconstant show, as we saw, a great variety and irregularity in different individuals.

But numerous cases of this kind presented in all essential details such an identical behavior, that the assumption seemed very plausible, that the nerve of one levator arises partly or exclusively from the nucleus of the motor part of the fifth nerve, which supplies the muscles of the jaw. Bielschowsky[10] points out, that in the great majority of these cases the concomitant movement was observed in a congenitally paretic upper lid, which suggests a causal relation between a process which led to the paresis of the levator and the transition of a number of motor fibers of the 5th nerve into the roots of the oculomotor nerve.

A portion of the fibers of the 5th nerve, supplying the muscles of the jaw, does not originate in the motor nucleus in the dorsal part of the pons, but in a series of ganglion cells, scattered in the lateral wall of the Sylvian aqueduct, near the nucleus of the oculomotor nerve, viz., the mesencephalic root of the 5th nerve. This is a favorable condition for the aberration of some of these fibers into the roots of the oculomotor nerve. Bielschowsky thinks that such a possibility may also be assumed for cases with normal oculomotor nerve, if they are congenital and stationary. Lindenmeyer[16] believes that cases in which the phenomenon developed later in life are doubtful, considering the uncertainty of anamneses, given by patients or their relatives; and those in which the affection subsided are so few in number that, according to Bielschowsky, they cannot refute the assumption of preformed connection of the levator with nuclei of other nerves.

The English commission, appointed to give a decision on the case, presented by Marcus Gunn, reached the conclusion, that the upper lid, influenced by the movements of the jaw, received nerve fibers from the nucleus of the 3rd branch of the 5th nerve, which supplies the external pterygoid muscle. As the anterior part of the biventer maxillae is supplied by the 5th nerve, the posterior by the facial nerve, Helfreich assumed an innervation of the upper lid from the nuclei of the 5th and facial nerves; and Bernhardt thinks of the possibility that also the nucleus of the hypoglossal nerve participates in the innervation of the levator, since the muscles which fix the hyoid bone for the action of the muscles that open the mouth, are supplied by the hypoglossal nerve. In those cases in which the movements of the upper lid were associated with swallowing, which is governed by the 3rd branch of the 5th, the hypoglossal, glossopharyngeal, and pneumogastric nerves, one would have to assume a connection of the nerve for the levator with the nuclei of these nerves.

Is there an anatomic connection between these nerves? From a combination of anatomic researches and physiologic experiments, especially in monkeys, this question can be answered in the affirmative. Crossing of the fibers, not only of the 4th nerve, but of all from the 3rd to the 12th cranial nerves, and communications of the nerves between each other are, according to Merkel,[17] most likely. These communications most probably gather in the dorsal longitudinal fascicle, which is encountered in all cross sections of the mesocephalon to the medulla oblongata, where it is found next to the raphe and near the surface of the rhomboid fossa. It is an immediate continuation into the anterior fascicles of the spinal cord.

One can observe with certainty that the nuclei of the nerves of the ocular muscles are connected with each other in the longitudinal fascicle, and Merkel says one may not be wrong in assuming in it also connections with other cranial nerves. Thus van Gehuchten found in the duck that the fibers of the longitudinal fascicle give collaterals to the nucleus of the hypoglossal and to the nuclei of the nerves of the ocular muscles. Bernheimer ascertained radiations from this fascicle into the homolateral nuclei of the 3rd, 4th, and 6th nerves. According to von Kölliker, von Bechterew, van Gehuchten, and Spitzer, the longitudinal fascicle contains long and short ascendent and descendent fibers. This shows the physiologic importance of this fascicle.

Bernheimer (p. 82) assumes that the nucleus of the auditory nerve by anatomic relations with the abducens

connects through the longitudinal fascicle with the other motor nuclei of the ocular nerves. On this path the well known reflex ocular movements after sound impressions may be elicited. According to the comparative anatomic researches of Ziba,[18] the dorsal longitudinal fascicle in certain classes of animals most likely is the only reflex path for changes of the tonus of the ocular muscles dependent upon the labyrinth. He found that its magnitude varied not only in different classes of animals, but also in different species of the same class, being greater in types of more lively movements; as these are more frequently apt to get out of position of equilibrium and require labyrinthine ophthalmostatics in a higher degree, than the more slowly moving animals, Ziba infers, that the longitudinal fascicle is in intimate relation to the mobility of the animals.

Thus as an anatomic connection between the nuclei of the different cranial nerves seems to be established, it does not appear improbable that under certain physiologic deviations or pathologic conditions, associated movements of the upper lid on innervation of the nuclei of other cranial nerves may be elicited along these paths. Lutz[15] opposes the theory of abnormal nuclear connection of the levator fibers, saying that it does not explain the cases without ptosis, nor those which developed during life, nor those in which the phenomenon subsided, and is very improbable if more nuclei than that of the 5th nerve are involved, e. g. in swallowing.

He argues: "all these cases have in common that the abnormal movement of the lid occurs with the so-called common or principal movements of Munk, the phylogenetically old, congenital, or soon after birth acquired, acts, as chewing, swallowing, etc., which are innervated from the subcortical motor centers, while the cortex of the brain gives only the impulse and regulation to these movements. They do not set in with the separate movements of Munk, the finely graduated muscular achievements, e. g. wrinkling of the forehead, which are entirely dependent on the motor zone. With the assumption of a defective congenital or acquired isolation of these subcortical centers a propagation of a stimulation upon a neighboring path, e. g. the levator may be thought of, which in the cases without ptosis would be intact, or otherwise damaged farther upwards, and thus could not be used voluntarily. Where the disturbance is situated, whether in the optic thalamus, whose lesion is distinguished by markedly frequent disorders of coordination, cannot be determined on account of our insufficient knowledge of the supranuclear centers."

"Demaria and Caldora[19] have quite recently described a case with slight ptosis disappearing and leaving exposed a part of the sclera above the cornea when the inferior maxilla was drawn downward in mastication. "The elevation of the upper lid attained its maximum when the jaw was moved laterally in the opposite direction from the affected eye. The other ocular muscles were normal, but the pupil was larger than that of the other eye, although its reactions to light, accommodation, etc., were not impaired." On account of the anisocoria the authors claim that the trouble must reside in the cortical centers near the foot of the frontal convolutions, which are probably connected with each other by Meynert's U fibers.

In a case of Menacho,[20] a girl, aged 20, with normal eyes, no ptosis, nothing particular was noticed until the age of 12, when it was observed that when she masticated the right upper lid retracted. "The movement of the right upper lid occurred only on depressing the mandible for mastication but not on moving it laterally. In view of the actual state of our knowledge, Menacho does not feel justified in making an exclusively anatomic explanation. He believes that careful observation shows the close relation between the functions committed to the cranial nerves, that we must attribute it, *a priori* to associations on a level with the nuclei of origin, or among the subcortical centers, or in the cerebral cortex, and that these paths of communication, which physiology presents and anatomy tries to confirm, can be dis-

placed functionally by inhibition or by irritation, and this would explain, provisionally, this interesting phenomenon. The anatomic theories meet, according to Menacho, the indestructible argument in the acquired cases: How explain in these the establishment of anatomic associations of new formation, not only among the immediate nuclei, as those of pair III and the masticatory nucleus of V, but in those in which the association had to take place among those of III, V, and XII, and others? How explain those in which the phenomenon disappeared?"

It seems to me that, with consideration of the above discussed anatomic relations between the nuclei of other cranial nerves, and those of the nerves of the ocular muscles thru the longitudinal fascicle, an abnormal propagagation of excitation may as well occur there, as in the subcortical ganglia or the cortex.

I would like to bring out another point, which has not been explained by the authors, viz., that in our case and in most others the lid phenomenon occurred only when the patient looked down, and stopped when he was induced to look up, while the suction or mastication continued. This has some resemblance with the cases of paralysis of the oculomotor nerve of Bielschowsky and Sölder, in which the levator, which was paralyzed for direct innervation, contracted on the impulse of downward fixation. It suggests the possibility that the phenomenon was an associated movement with the action of the inferior rectus, and was not directly dependent on the movement of the lower jaw, but only indirectly by means of the inferior rectus in so far, that with these movements was combined a contraction of the inferior rectus, stimulated by the natural psychic impulse of intense downward fixation.

As we saw, under the discussion of the physiologic concomitant movements, that some of these set in only in conjunction with very intense actions, thus in our case the phenomenon did not occur when the patient simply looked down, but immediately started when he commenced to suck with intense downward fixation, being exclusively interested in his bottle. Then we would have a connected abnormal innervation of different parts of the nuclei of one and the same nerve, of the oculomotor nerve, instead of having to assume a connection between the nuclei of the oculomotor and 5th and other nerves. In that case a plausible explanation could be given on the basis of anatomically and experimentally proven facts, from the observations of Lipschitz,[21] on concomitant movements in the course of paralysis of the facial nerve which he attributes to intermixture of fibers, supplying different muscles of the face, during the healing process. Bielschowsky thinks that if a portion of the roots or fibers of the oculomotor nerve with the sheaths of Schwann were destroyed, there was a possibility that not all of the regenerating fibers found again their old paths and the muscular fibers in which they terminated before the lesion. They rather landed in greater or lesser numbers in foreign paths, of which those ending in the levator palpebrae seem to be especially accessible, in his cases for fibers originating in the nucleus of the inferior rectus. This explanation might be applied to the cases in which the lid phenomenon occurred in downward fixation of eyes with paralysis of the oculomotor nerve.

I mention it only as an instance of great biologic interest how a faulty isolation or abnormal combination of different nuclei or roots or fibers of the same nerve, supplying different muscles, and perhaps also of different nerves connected thru the longitudinal fascicle, may occur, and, although observed in pathologic conditions, may, as so many questions of physiology, lead to the understanding of apparently physiologic deviations, perhaps by prenatal processes, which themselves are not evident after birth.

However, if this assumed possibility is fallacious, the arrest of the phenomenon in looking upward, can easily be explained by the preponderance of the natural synergy between levator and superior rectus which holds the lid in

extreme elevation, due to their above described anatomic connections and nuclear relations, over the abnormal innervation impulses from nuclei of other nerves which govern the acts of suction, swallowing or mastication.

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ETIOLOGIC FACTORS IN AN EPIDEMIC OF ACUTE CONJUNCTIVITIS AT CAMP SHERMAN

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A discussion of the bacterial and mechanical factors concerned in the production of conjunctivitis with statistics of the bacteriologic findings in an epidemic occurring in Camp Sherman near Chillicothe, Ohio.

Conjunctivitis in epidemic form developed at Camp Sherman the latter part of October, 1917, and ran well into January, 1918. An epidemic of conjunctivitis in the army is not unlike such epidemics in civil practice except that it is sure to be more widespread by reason of the crowded condition of the men, and their close association, either at work, at play or at rest.

The barracks at Camp Sherman were large, but not very well heated. One reason for the widespread character of the epidemic was that it began after cold weather had set in, and to make the most of the artificial heat, the ventilation was defective in these rapidly constructed semi-permanent quarters.

In this connection it will be of interest to ask whether there is more epidemic conjunctivitis in the camps where the men are quartered in frame barracks, than in those camps where the men are under canvas. Evidently the same bacterial and mechanical agents are present in both instances in all the various camps. The crowding will be the same but the ventilation is certainly much more thorough in tents than in barracks, whether heated by steam or large stoves.

As regards those cases of conjunctivitis in which no bacteria were found, but in which there was decided conjunctival injection of both the bulbar and palpebral membrane, the question

arises as to whether it could be mechanical; and due only to "cold," dust, smoke and the crowded proximity of men in their beds and at table.

The question of "cold" of course, includes wind with a low temperature, especially the cold alternating with the wind of the drill ground; and out-door work generally alternating with the less humid, warm atmosphere of the artificially heated barracks. This repeated heat and cold, with the attendant lacrimation, causes an injection of the conjunctival vessels; which develops a decided relaxation of the vessel walls, and infiltration of the conjunctiva, i. e., *mechanical conjunctivitis.*

There were two sources of dust or foreign particles; the dust in the air from sweeping and tramping on the floors of quarters which had not been oiled; and the dust from the roads. These particles of dust in great numbers entering the conjunctival sac produce a reaction; and, with the continual rubbing of the eyes, which their presence encourages, is a source of conjunctival disease, that sends men to the hospital for relief.

This dust aided and abetted by the smoking of the men in quarters, plus the smoke and gas from the stoves might, perhaps, be sufficient to keep the conjunctiva injected; and a source of complaint, besides furnishing a fruitful field for bacterial invasions. The element of smoke alone, as a cause of conjunctivitis, is sufficiently shown by the conjunctivae of the inhabitants of the far north, huddled together in small huts from which the smoke of indoor fires and lamps does not have free vent. The crowding of many men at tables, and the close proximity of beds are a decided assistance in the spread of bacterial infections, more than the production of mechanical conjunctivitis.

Of the bacteria found in the series of cases at Camp Sherman, the organism most frequently present was the pneumococcus, although the other organisms usually found in these epidemics were present in some few cases.

The number of pure Koch-Weeks infections was decidedly small; more so than one would have reason to expect from the large amount of literature on the subject. Likewise the Morax-Axenfeld infections were quite few. From the above we find a decided change in the order of precedence from the findings of Pollock, Morax, von Meande (Riga) and many other observers.

The bacterial agents in the epidemic at Camp Sherman did compare somewhat with the short series of cases of Veasey, and with the author's records of seventy-eight cases in private practice, observed in the spring and summer of 1916 at Bath, Maine. The cases of Koch-Weeks and Morax-Axenfeld were very mild, and much shorter in duration than many of the cases in which no bacteria were found.

As indicated previously, the striking feature of this epidemic is the large percentage of cases in which our competent and painstaking laboratory experts were unable to find organisms. Not only was the absence of bacterial growths demonstrated, but the secretion and discharge from the conjunctival sac were very limited in amount, even in cases of decided conjunctival reaction.

There were in the series three cases of *gonococcus infection,* one of which was reported by Lieut. Stevenson in the Ophthalmic Record of December, 1917, page 621. Each of these cases probably presented itself earlier than would have been the case if an epidemic of "pink eye" had not "been on" in this camp. At first they showed much the same clinical manifestations as the other cases, and their true nature was demonstrated by the laboratory examination. Because they were seen early, they yielded to treatment readily. As might have been expected in a command in which epidemic meningitis was present, in some few cases the meningococcus was found.

One case of xerosis bacillus infection was demonstrated.

A fair percentage of cases were shown to belong to one of the various types of staphylococci. In one instance only did a serious complication arise. This was a case of severe corneal ulcer with pneumococcus infection of the conjunctiva.

The epidemic was very wide-spread, affecting over twelve hundred men known to the authorities of the base hos-

pital. Many others were diagnosed and treated in the Regimental Infirmaries.

Isolation of the more severe cases was carried out, but it was practically impossible to segregate all. It is believed that a considerable number of milder cases went untreated as they were not reported.

The following table is the result of the laboratory examinations. The chief bacteria found were:

Pneumococcus	37.5%
Staphylococcus (various types)	6.0%
Meningococcus	1.5%
Koch-Weeks bacillus	2.5%
Morax-Axenfeld bacillus	3.5%
Organisms undetermined	9.0%
No organisms	40.0%

DEFECTS IN EDUCATION FOR OPHTHALMIC PRACTICE.

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These defects center chiefly in lack of fundamental training in physiologic optics, anatomy and pathology. They are to be met by graduate courses in these branches in universities and under the auspices of special societies. Paper read before the American Academy of Ophthalmology and Oto-Laryngology. October 30, 1917.

The common and glaring defects in training for ophthalmic practice have arisen from imperfect preliminary and undergraduate medical training; and from the general failure to recognize that ophthalmology includes a mass of special facts and processes that will be acquired only through the personal relation of teacher and student.

At a time when every medical student was expected to learn how to use the stethoscope and clinical thermometer, not one in fifty was given instruction in the use of the ophthalmoscope. The preliminary requirements for entering the medical school took no account of parts of physics and mathematics fundamental to ophthalmology. When ophthalmology was recognized in the curriculum of undergraduate medical study, it was as a clinical branch given near the close of the course, still without recognition of the laboratory work and systematic training, on which alone the sound clinical teaching of it could be founded. Only in the last few years, and still in a minority of schools, have these defects been remedied.

The medical education of the student who has just received his doctor's degree is generally in an embryonic state; but a large proportion of those now engaged in the practice of medicine in this country have a medical education especially defective in respect to ophthalmology, and little opportunity or encouragement has there been to remedy these defects. The postgraduate schools, started a third of a century ago, were wholly clinical. Profitable clinical teaching presupposes a preliminary course of systematic study. The measurement and correction of astigmatism can only be intelligently carried out by one who knows what astigmatism is, and after its relations to emmetropia, hyperopia, myopia, and accommodation are understood. The clinical characteristics of a corneal inflammation become significant in proportion as the observer knows the anatomy and pathologic tendencies of the cornea; and its relations to sclera, conjunctiva, lids, and iris.

The average graduate in medicine lacked the preparatory training that would enable him to profit by the clinical study of ophthalmology. If his teacher had not the same defects, to a degree that made him unconscious of them in the student, he was likely to

become discouraged with the poor material he had to work on; and the misguided would-be specialist spent his six weeks in watching a parade of cases that he never fully understood or could profit by. Teaching so given is necessarily ineffective; and no repetition of such clinical courses could ever give a satisfactory education in ophthalmology. It is still too much the accepted model for ophthalmic teaching.

There has been a great improvement in some schools that give graduate teaching in ophthalmology. Systematic courses are now given extending over three months to a year. And some instruction is given in ocular anatomy, pathology, and optics, along with the clinical work. But the best courses of this kind leave much to be desired; they are not given at all schools; and they are taken by only a minority of those who are preparing for ophthalmic practice. There seems to be no general understanding of the importance of these branches. A few private instructors have stimulated their assistants to do the needful study of these fundamentals. But too often there has been no suggestion to the student that anything more than attendance on a clinic was needed to make him an ophthalmologist.

It has been supposed in the past that an internship in an ophthalmic hospital was a superior opportunity for preparation for ophthalmic practice, and in many respects it is. But on a young graduate in medicine ignorant of ocular anatomy and pathology, and physiologic optics, such an opportunity is largely thrown away. A year or eighteen months' service in such a position may still leave him defective in fundamental knowledge that would have made his internship truly valuable; and leave him unprepared to meet the needs of the cases that will form three-fourths of his work in private practice.

This is not a merely theoretical indictment of our methods of teaching ophthalmology in this country, heretofore. Every point in it has been supported and emphasized by a year's experience in the work of the American Board for Ophthalmic Examinations. These educational shortcomings appear in the case histories submitted, in the papers produced in written examinations, and in the laboratory and clinical work of the candidates. It is too much to suppose that they will not impair the quality of the service an ophthalmologist so poorly trained can render to the community. I do not for one instant forget that every ophthalmologist now addressed has done something to remedy such defects, some attaining great success, others with but indifferent results. But not one of us is free from the defects entailed by lack of proper training. It is our business to see that those who come after us will have a better chance.

PRELIMINARY TRAINING.

There is a proper sequence for the building of a house, or the learning to walk. There is an orderly effective way of bringing together the knowledge we have to use in ophthalmic practice; and learning to manipulate its instruments and apply its facts. Anyone who has worked in ophthalmology can give some hints as to what this order and these facts and instruments are. We who have gone over this ground, however, slowly, laboriously, and by devious ways, can point out to others some of the more direct and easier paths by which they can travel. It is our business to do so, to work out an order in which ophthalmology may be most profitably studied.

The preliminary studies of especial importance, apart from those preparatory to the study of medicine in general, are mathematics, optics, and drawing. Of *mathematics* geometry and plane trigonometry are essential to an intelligent study of optics. So far as I know plane trigonometry is nowhere required as a preliminary to the study of medicine. Yet it is hardly possible for one who does not know something of plane trigonometry to understand the first law of refraction as it is commonly stated.

It is too much to expect that all medical students shall have trigonometry before entering upon the study of phys-

iologic optics. But it is not too much to expect that every physician who proposes to prepare himself adequately for ophthalmic practice shall study plane trigonometry. For such it is time saved. We have required it for the graduate degree in the University of Colorado. The first graduate student to take our course began by hunting up a high school teacher of mathematics, and taking under him a course on trigonometry. This plan is open to any one who lives within reach of a good high school, and the branch is one that can be mastered by a good student from the book alone.

Of algebra not much is required in preparation for an understanding study of ophthalmology; and this is furnished in most college or high school courses that require some mathematics. For advanced study "descriptive" geometry and mathematical drawing will more profitably employ the student's time and energy. It is not too much to ask that any doctor of medicine who expects to take up ophthalmic practice as his specialty, should begin by making good the mathematical foundation necessary for a good and early mastery of physiologic optics.

The needed study of *optics* is possible in any well equipped university or advanced school of physical science. But the opportunities so offered are not particularly attractive or well-suited to the student of ophthalmology. Physiologic optics is a special branch of the science, of interest chiefly to those who have studied medicine. The course arranged by the professor of physics does not go very far in that particular direction, and does give more of other parts of optical science than is needed by the ophthalmologist.

In a way physiologic optics can be studied by the help of books. But it can only be mastered by carefully performed and thoroughly understood experiments. The essential laboratory fittings are neither elaborate or expensive, but it should be largely a laboratory course. Special instruction in ophthalmology should begin with such a course. It might be arranged in connection with any graduate school of clinical medicine. But in fact a good course of the kind scarcely exists in America. Recently the best advice that could be given to a graduate student of large clinical experience ,who wished to get a mastery of physiologic optics was that he should get Burch's *Practical Exercises in Physiological Optics,* and try to teach himself and a fellow student.

Drawing should have an important place in systematic training for ophthalmic practice. It may not be the only way, but it is an excellent way to get training in the accurate use of eye and hand that is greatly needed in ophthalmic work; and it is the only study usually given in an academic curriculum that does furnish this. It may be taken as preliminary to the study of medicine, in which case its value will be evident at all stages of the medical course. Or it is worth while to cultivate it on taking up the special study of ophthalmology. Not much can be expected in the way of teaching it in graduate medical schools. But the student who has had its value pointed out, can work at it alone, or can find help from professional draftsmen or artists.

THE COURSE IN OPHTHALMOLOGY.

The special training for ophthalmic practice needs to be greatly improved in these three directions: physiologic optics, anatomy, including the minute anatomy, and the pathology of the eye. When the training in these branches has been made more thorough the present facilities for clinical instruction will become more valuable and effective. Enough has already been said regarding physiologic optics in connection with preliminary training. But in the near future we will have to depend largely on graduate schools in ophthalmology to furnish it. They should take it up with the purpose of making it thorough, and of giving it before much time is given to clinical work.

The *anatomy* of the eye and of closely related parts need not claim much time in the graduate course. Some things about it are fairly well taught in the general medical course. The most se-

rious criticism of such teaching is that it does not go sufficiently into minutiae to meet the needs of special practice; and it does not deal sufficiently with the fresh or living eyeball. If anatomic material of the proper kind is close at hand, this instruction can be given in connection with operative or other clinical work. The essential thing is to emphasize the important anatomic facts, and not to allow them to be overlooked in the concentration of attention on operative or therapeutic procedures.

For the proper teaching of *ocular pathology* a course must largely be built up *de novo*. Not that good courses in pathology have not been offered from time to time in the past, for they have; but that they have not often been taken or given. For students trained as good medical schools now train their undergraduates in general pathology, the course in ocular pathology need not be a long one. Perhaps one month of well-planned, intensive training would be fairly effective. But it is a part of the course that needs to be carried out under the eye of a master. In few branches is the timely hint or the correction of faulty technic and inference so important. It is not merely a matter of learning to recognize certain tumors and pathogenic bacteria, it is to learn to see and appreciate all ordinary pathologic changes in all the ocular tissues. The course in ocular pathology will more and more be the test of the thoroughness of the teaching of ophthalmology in any special graduate school.

The *clinical work* is the part of the teaching of ophthalmology that is now best developed and can best be trusted to take care of itself in the immediate future. When it is sought by students well-prepared in the branches already alluded to, it will inevitably become more effective. But a little appreciation of the general principles of pedagogy would greatly improve it. Between the uninspiring narration or "pumping in" of facts, and the abandonment of the student to his own powers of observation and deduction, lies the whole realm of teaching. There seems to be a very strong tendency to abandon real teaching for the easy routine on either side. It requires more exertion to find out what the student knows or understands, and connect this with what he needs to learn, than it does to prose forth the line of thought that passes through the teacher's mind; and it is still easier to bring the student before a patient and abandon him to his own devices. Perpetual stirring up is required to keep clinical teaching effective and thorough.

In this department of clinical work the most important portions are diagnosis, and the exact estimation of errors of refraction. The examinations of the American Board show that while every one who comes up has tried to gain some skill in these directions, the general lack of thoroughness and skilled guidance is painfully evident. Men of rather large clinical experience have fallen down wofully in regard to the recognition of intraocular conditions, or the exact estimation of refractive errors. One who has passed a full internship in an ophthalmic hospital may be quite ignorant of any systematic method of hunting down an error of refraction; and show lack of any instruction as to the systematic use of the ophthalmoscope.

Case histories have shown strikingly deficient training in their taking and recording even among those who have had years of clinic and hospital experience. In this respect ophthalmologists compare but poorly with the better trained of general surgeons. There are reasons for which the surgeon or the neurologist should be stimulated to keep complete records of his cases, that do not apply with equal force to the ophthalmologist. But making all due allowances, the deficiencies in the matter of case histories that have been brought to light by the experience of examiners in the American Board for Ophthalmic Examinations, are very serious. The attention of all teachers of opthalmology should be called to them, and the need for better work in this direction emphasized.

The ophthalmic training of every student of medicine should include some

careful instruction with regard to case taking and case records. This should be made a center of organization for his knowledge of ophthalmic diagnosis, the branch of ophthalmology most important for the medical man who does not enter especially into ophthalmic practice.

REMEDIES.

The worst defects in present training for ophthalmic practice would be met if each university that has a medical department would establish short courses in physiologic optics, ocular anatomy, and ocular pathology, and would bring these to the notice of every medical student as courses to be taken before seeking the clinical part of training for ophthalmic practice. Even though the medical student manifests no immediate interest in them, he would think of them when his attention began to turn to ophthalmology as a specialty. If the whole medical profession understood the importance of such instruction, it could better judge the qualifications of the men who claim to be specialists in this direction.

Such courses should be established in connection with each graduate medical school that undertakes to teach ophthalmology; and the would-be student urged to devote the first weeks of his course chiefly or entirely to them. Every leader or teacher in ophthalmology has a duty to the profession and the public in this matter; and the announcement of the medical school can be made a most important instrument to bring about reform in this direction.

Those of us who are now engaged in ophthalmic practice are more or less conscious of our own deficiencies in regard to these studies fundamental to ophthalmology. It will be of great benefit to us individually as practitioners, to do something to remedy these deficiencies; and an open, concerted effort to do so will do more than anything else to enforce the importance of fundamental training on those who intend to make themselves ophthalmologists.

An organization like this could arrange to give, just before its annual meeting, a week of intensive training on the microscopic diagnosis of intraocular tumors, under three or four of its members who have given special attention to ocular pathology. Or, to make the best use of the time with the least strain of any one set of powers, this might be combined with a similar course on experimental optics, or the minute anatomy of the eye with reference to operations on the anterior segment, or the location of foreign bodies. Such courses should be put on a basis of fees that would compensate the instructors, and provide the necessary material or equipment. Similar courses could be arranged by local ophthalmologic societies for the benefit of their own members, and to suit their convenience.

Finally, it would help to remove the greatest defects in training for ophthalmic practice, it would emphasize the importance of fundamental training, if the American Board of Ophthalmic Examinations would divide its examinations into two parts. It could give to students who have been out of the medical school one year or more, an examination on ocular anatomy, the physiology of vision, geometric, experimental, and physiologic optics, and ocular pathology. Two or more years later it could give the examination in ophthalmoscopy, and other branches of clinical diagnosis, clinical examination of patients, therapeutics, and operative technic. Something of this kind is needed to prevent the essential preliminary work from being neglected; and to prevent such neglect from impairing the value of all training in the so-called practical branches.

THE COMPUTATION OF COMPENSATION FOR OCULAR INJURIES.

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A classification of such injuries for computing compensation with analysis of the various factors involved, and examples of methods to be pursued. Read before the Michigan State Medical Society, Battle Creek, Michigan, May 8th, 1918. Publication authorized by the Surgeon-General, U. S. Army.

The author requests that readers communicate to him their views upon this subject, in order that a compilation may be made embracing the views of American ophthalmologists, which may be presented as authoritative to the various legislative bodies.

Practically all laws dealing with compensation for injury to one or both eyes disregard partial loss of central or peripheral vision and have to do almost exclusively with the complete loss of light perception or the complete loss of the eyeball. Nor do any of the laws enacted by the various state legislatures take into account the loss of depth perception, so essential in many professions, while but few even mention disfigurement of the eyeball or its appendages. But a comprehensive survey of compensation due for injury to the eye, either directly or indirectly, must embrace these factors as well as many others.

Compensation must be based upon the loss of ocular efficiency suffered by the injured and this naturally opens the subject into subdivision into ten main groups, based upon the type of injury sustained:

I. Direct injury to one eye alone.

II. Direct injury to both eyes.

III. Direct injury to one eye alone, following which the second eye becomes affected by the visible inflammation known as sympathetic ophthalmia.

IV. Direct injury to one eye alone where the other eye has a vision of less than 0.1 or is absent.

V. Injury to the eyelids without involving the eyeball directly.

VI. Injury to the extrinsic ocular muscles.

VII. Injury to any part of the head, except the eye and its appendages, resulting in a disturbance of the visual field of one eye alone.

VIII. Injury to any part of the head, except the eye and its appendages, resulting in a disturbance of the visual field of both eyes.

IX. Injury to any part of the head, except the eye and its appendages, resulting in a central scotoma of one eye alone.

X. Injury to any part of the head, except the eye and its appendages, resulting in a central scotoma of both eyes.

It is not the purpose of this paper to discuss the actual amount of compensation due as a result of any injury, but rather to determine the percentage of a unit of compensation that may be due for any ocular injury. The laws of the majority of states have adopted 52 weeks' wages as the compensation due for the total loss of an eyeball, and throughout the remainder of this paper, that basis will be utilized as the unit of compensation, hereinafter graphically referred to as 100 C.

Before proceeding to a detailed discussion of the main groups, one other phase of the subject must be considered: a standardization of terms for the description of the value of vision. As normal or rather full vision, it is safe to adopt the empirical standard used the world over by ophthalmologists. That consists of a standard letter that subtends an angle of 5′ on the retina. Such a measurement may be made at 10, 15, 20, 25, 30, or 40 feet, or at 5, 6, or 10 meters, and the results are usually expressed in fractions; the numerator being the distance at which the test is actually made and the denominator being the distance at which the letter should be seen by the normal

eye. Many ophthalmologists prefer to express this fraction in tenths, and for this paper such a nomenclature is to be preferred. In order to simplify the reduction of these fractions to the decimal notation, the following table is appended:

The left-hand column is the decimal notation of visual acuity.

	6 M.	10 M.	10 ft.	15 ft.	20 ft.	30 ft.	40 ft.
2.00	6/3	10/5	10/5	15/8	20/10	60/30	40/20
1.50	....	.....	.....	15/10	.....	30/20	.....
1.00	6/6	10/10	10/10	15/15	20/20	30/30	40/40
0.90	....	.....	.....	.....	.....	.....	.....
0.88	....	.....	.....	.....	.....	.....	40/45
0.83	....	10/12	10/12	.....	.....	.....	.....
0.80	....	.....	.....	.....	20/25	.....	40/50
0.75	6/8	.....	.....	15/20	.....	30/40	.....
0.70	....	.....	.....	.....	.....	.....	.....
0.66	6/9	10/15	10/15	.....	20/30	.....	40/60
0.60	6/10	.....	.....	15/25	.....	30/50	.....
0.55	....	10/18	10/18	.....	.....	.....	40/70
0.50	6/12	10/20	10/20	15/30	20/40	30/60	40/80
0.42	....	.....	.....	.....	.....	30/70	.....
0.40	6/15	10/25	10/25	.....	20/50	.....	40/100
0.37	....	.....	.....	15/40	.....	.....	.....
0.33	6/18	10/30	10/30	.....	20/60	30/90	.....
0.30	....	.....	.....	15/50	.....	30/100	.....
0.29	....	.....	.....	.....	20/70	.....	.....
0.25	6/24	10/40	10/40	15/60	20/80	.....	.....
0.22	....	.....	.....	.....	20/90	.....	.....
0.20	6/30	10/50	10/50	15/75	20/100	.....	40/200
0.16	6/36	.....	.....	.....	.....	.....	.....
0.15	....	.....	.....	.....	.....	30/200	.....
0.10	6/60	10/100	10/100	15/150	20/200	30/300	40/400

It is realized that a vision of 20/40 or 0.5, although theoretically only one-half of full vision, represents far more than merely half vision to an injured eye. But it is absolutely impossible to estimate accurately just how useful that degree or any reduced degree of vision is, and consequently it becomes necessary to adhere to the more or less theoretical tables until a very low degree of vision is reached. For all practical purposes it may be assumed that vision of 0.1 or less is equivalent to no vision, and entitles a man to compensation upon that basis. To endeavor to differentiate between absolute loss of sight (amaurosis) and loss of sight to such extent that only non-useful vision remains, is unnecessary from a practical standpoint. Again, the loss of an eyeball entitles the injured to greater compensation than merely complete loss of vision and this table so provides.

I. Direct Injury to One Eye Alone.

Under this heading come the cases of direct injury to one eye alone, whereby the vision of that eye only is reduced. Time forms a factor in the estimation of compensation, and as this factor is so variable it becomes necessary to establish a definite time when the examination upon which the compensation is to be based shall be made. From an empirical standpoint, it seems best to insist that at least two months elapse between the time when the last trace of visible inflammation has disappeared from the eye involved and the time of examination.

This factor having been fixed, there remain four variable factors that have to be taken into consideration:

A. The vision of the injured eye. This must be computed in tenths according to the table previously given. The amount of vision to be used as this factor is the best possible vision to be obtained with or without the aid of correcting glasses, provided that the strength of the spherical lens required to obtain the best vision be not more than four diopters different from the spherical lens required to obtain the best possible vision in the other eye. Should a difference of more than four diopters exist between the spherical refraction of the two eyes, the uncorrected vision of the injured eye is to be used. Should a vision of less than 0.1 exist, such vision shall count as 0. The value of this factor is to be 100 or fraction thereof. (Example: vision of 0.6 shall count as 60, vision of 0.4 as 40, etc.)

B. The vision of the uninjured eye. This is to be computed on the basis of 100 or fraction thereof as in the case of the injured eye and the best possible vision, either with or without correcting glasses, irrespective of the strength of such glass, is to be utilized. The vision recorded is to be that determined at the time of the examination upon which the compensation is based, regardless of the visual results of any previous examination. (Example: full vision or vision 1.0 shall count as 100; vision of 0.6 shall count as 60, etc.)

C. The ability to recognize depth at arm's length or less (the estimation of the third dimension). This is essentially a function of two seeing eyes, but may exist in the presence of a marked difference in the visual capability of the two eyes. As a rule, if

there be a difference of more than 0.7 between the vision of the two eyes, true depth perception is lacking, but may be replaced by monocular pseudo-depth perception. This faculty, however, usually requires at least a year for its full development. The simplest method of estimating depth-perception is by the Hering drop test, which instrument should be in the possession of the Board of Compensation. At least ten tests should be made with this instrument to determine the presence or absence of this function and upon the results of these tests, the percentage of depth perception may be estimated. Depth perception may be rated as 100, if undisturbed, or any fraction thereof shown by the tests, or as 0 if entirely absent.

D. Cosmetic result. The effect of the result of a disfiguring injury upon the individual cannot be neglected. Disfigurements of the eyelids or eyeballs entitle the injured to a greater compensation than mere injury to vision alone. But under this sub-heading come only the cases of disfigurement of the eyelids or eyeballs when accompanied by a loss of vision dependent directly upon the injury. Mere disfigurement alone resulting from injury without damage to the vision is classed under main Types V and VI.

The value of this factor is to be 50 or fraction thereof, determined by the Board upon the degree of disfigurement present at least two months after the original injury has occurred.

In compiling these four factors into an adjudgment of compensation for injury to one eye alone, the injured ball shall be placed in one of two classes:

(a) Individuals whose employment is of a character that ability to estimate depth at arm's length or less is essential.

(b) Individuals whose employment is of a character that ability to estimate depth at arm's length or less is not essential.

In class (a), the vision of the injured eye, plus the vision of the uninjured eye, plus the percentage of depth perception, plus the figure determined by the Board as the percentage of disfigurement; all divided by 3.5 shall represent the ocular efficiency of the injured. This figure subtracted from the full compensation of 100 represents the percentage of compensation to which the injured is entitled.

For example, a machinist is injured in one eye with a resultant vision of 0.4; the vision of the uninjured eye is normal or 1.0. He is able to perceive depth only twice out of ten attempts, which determines the value of this factor as 20; no external scars are visible; then

Factor A = 40
Factor B = 100
Factor C = 20
Factor D = 50

210 divided by 3.5 = 60% ocular efficiency.

Compensation 100
Efficiency 60

40% Compensation that the injured is entitled to.

In class (b), the method of procedure is identical, with the exception that factor C is eliminated, for in this class of individuals, depth perception is not essential to their efficiency. The final result is obtained by the addition of A, the vision of the injured eye, and B, the vision of the uninjured eye, and D, the cosmetic result, all divided by 2.5 and this figure subtracted from 100.

For example, a trench digger is injured in one eye with a resultant vision of 0.4; the vision of the uninjured eye is normal, no external scars are to be seen; then

Factor A = 40
Factor B = 100
Factor D = 50

190 divided by 2.5 = 76% ocular efficiency.

Compensation 100
Efficiency 76

24% Compensation that the injured is entitled to.

II. Impairment of Both the Eyes.

The four factors that are considered under heading I enter into the discussion of this type of injury and they must be computed in the same manner as before, with but one difference. Total compensation, percentages of which are calculated, must be three times that estimated for one eye alone, as deprivation of sight is of greater consequence when involving both eyes. The factor of depth perception must be calculated exactly as in class (a), heading I.

For example, a man suffers an injury involving both eyes, with a resultant vision of 0.4 in one eye and 0.6 in the other. He has lost 50% of his ability to judge depth and the resultant corneal maculae have a disfiguring value of one half or 25; then

Factor A = 40
Factor B = 60
Factor C = 50
Factor D = 25

175 divided by 3.5 = 50% ocular efficiency.

Compensation 100%
Efficiency 50%

50% Compensation,

which in this case represents 150 C., as the compensation has been trebled for this type of cases.

III. Direct injury to one eye alone, whereby the second eye becomes affected with the visible inflammation known as sympathetic ophthalmia. The discussion of this type of compensation is necessarily based upon the time element. Under heading I, it was stated empirically that two months should elapse between the time that the last visible trace of inflammation had disappeared from the injured eye, and the examination upon which the compensation was to be based. Sympathetic ophthalmia may appear at any time following an injury, but over 80% of the cases develop within thirty-five days. Consequently if two months have elapsed after the subsidence of visible inflammation without involvement of the second eye, it is fairly safe to assume that the greatest danger is past and that another trauma is necessary to arouse the sympathizing inflammation. If a sympathetic ophthalmia does appear within the time limit herein stated, at least twelve months and not more than sixteen months must elapse before compensation may be determined. It should then be established on the same basis as under heading II.

IV. Direct injury to one eye where the other eye is absent or has a vision of one-tenth or less.

The gravity of an injury to an eye under this heading is great, and the compensation can be governed by one factor only, viz., the ultimate vision. The more this is damaged, the greater must be the compensation, but no arithmetical or geometrical progression can establish the proper amount. Table II shows the compensation due, based upon ultimate vision:

Ultimate Vision	Compensation Due
0.9	15%
0.8	30%
0.7	50%
0.6	75%
0.5	100%
0.4	200%
0.3	300%
0.2	400%
0.1 or less	500%

V. Injury to the eyelids alone, not involving the eyeball or ocular muscles.

Injury to the eyelids alone, not involving the eyeball or ocular muscles, is so rare and may be so varied in character that no hard and fast computation of compensation is possible. The factors that must be taken into consideration are:

(1) Injury of such a character that the eyeball eventually suffers by exposure. (Lagophthalmos.)

(2) Injury of such a character that the distortion of the lids eventuates in resultant damage to the eyeball. (Entropion.)

(3) Injury of such a character that there results a constant overflow of tears. (Ectropion with epiphora.)

(4) Cosmetically disfiguring injury.

The estimation of compensation should be withheld until three months

after the injury has occurred, and then must be determined by the board for each case. In no case shall the compensation be greater than 100 C.

INJURIES OUTSIDE THE EYEBALL.

VI. Injury to the extrinsic ocular muscles.

This may be in the nature of a direct trauma to one or more muscles themselves or to the controlling nerves. Time is one of the principal elements that must be reckoned with in the consideration of this type of injury and no compensation may be estimated until at least four months have elapsed subsequent to the injury and not more than eight months. If an operation is deemed advisable by the physicians in attendance to reattach a severed muscle, or to shorten a relaxed muscle, or to improve the muscular condition in any way possible, it should be performed within the time limits stated. As vision is not a factor of this type of injury, all cases may be placed in one of two classes:

(a) Those with a resultant horizontal diplopia and

(b) Those with a resultant vertical diplopia.

The first of these two classes is the least serious, and as such is entitled to less compensation than the latter, the amount of diplopia does not enter into consideration, for a minor degree is as serious as a high degree as regards visual capability of the individual. Inasmuch as the subjective phase of diplopia eventually disappears with the education of one eye in the suppression of its image, the injured cannot claim full compensation for complete loss of vision of one eye. With these points in mind, 40% C is adequate compensation for class (a), and 60% C for class (b).

VII. Injury to any part of the head, except the eye and its appendages, resulting in a disturbance of the visual field of one eye alone.

In this class of cases, a double compensation must be considered; that for the injury to the head, and that for the injury to the visual function. The latter class alone is considered in this paper, and the compensations herein determined are in addition to whatever the board may fix for the primary head injury. The time element is the same as that considered under heading I.

(a) Vision normal: nasal half of one visual field deficient even as far as the 10° meridian. *No compensation* because there is no visual loss, the field defect being taken care of by the temporal half of the opposite field.

(b) Vision reduced: nasal half of one visual field deficient even as far as the 10° meridian. Compensation based upon the calculations provided for under heading I.

(c) Vision normal: temporal half of field missing even as far as the 10° meridian. According to Maschke, this reduces the visual capability of an eye about 1/6 and entitles the injured to 10% compensation.

(d) Vision reduced: temporal half of field missing even as far as the 10° meridian. The compensation for the reduction of vision is to be calculated under the formulae given in heading I, to which is to be added 10% C for the visual field contraction.

(e) Vision normal: concentric contraction of the visual field of one eye. The ocular efficiency of an eye is not greatly impaired by this type of injury until the contraction is of such a high degree that the resultant vision is practically tubular in character. The following table shows the amount of compensation due for

Concentric contraction of one visual field to	
60° =	C 0
40° =	C 5%
20° =	C 15%
10° =	C 30%
5° =	C 75%

(f) Vision reduced: concentric contraction of the visual field of one eye. For the reduced vision, the compensation must be calculated as under heading I, to which is added the compensation due for concentric contraction of the visual field of one eye alone as shown in the above table. (Heading VII-e.)

VIII. Injury to any part of the head, except the eye and its appendages, resulting in a disturbance of the visual fields of both eyes.

Four types of cases must be considered under this heading:

(a) Vision normal: more or less concentric contraction of both visual fields. The following table gives the compensation due for such injuries.

Concentric Contraction to 60°=C 5%
" " " 40°=C 10%
" " " 20°=C 25%
" " " 10°=C 60%
" " " 5°=C150%

(b) Vision reduced: more or less concentric contraction of both visual fields. A double calculation is here necessary; the first for the reduction of vision based upon heading I, and the second upon the field contraction as per the above table. (Heading VIII-a.)

(c) Vision normal: homonymous hemianopsia.

(1) If the visual field defect does not approach nearer to the center of the field than 17°, the visual capability of the man is not reduced more than 10% and that is the compensation such an injured person is entitled to.

(2) If the homonymous field defect encroaches beyond the 17° meridian, but still insufficiently to affect macular vision, thus throwing the case under heading (1), the compensation must be based upon the type of defect, a table of which follows:

Left-sided homonymous hemianopsia = C 50%
Right-sided homonymous hemianopsia = C 150%
Superior homonymous hemianopsia = C 50%
Inferior homonymous hemianopsia = C 100%

(d) Vision reduced: homonymous hemianopsia.

(1) If the hemianopsia does not become more central than 17°, compensation must be estimated upon the reduction of vision as calculated under heading (1), plus 10%.

(2) If the hemianopsia intrudes within the 17° meridian, the compensation must be the result of the calculation based on heading (1), plus the compensation shown above under heading VIII, class (c), subhead (2).

(e) Vision normal: bitemporal hemianopsia.

The visual efficiency is but slightly reduced in this class of cases and the injured is entitled to but 15% compensation.

(f) Vision reduced: bitemporal hemianopsia.

To the calculation for the reduced vision as estimated under heading (1), must be added 15% for the visual field defect.

(g) Vision normal: binasal hemianopsia.

The visual capability suffers somewhat more in this type of injury and entitles the injured to 25% compensation.

(h) Vision reduced: binasal hemianopsia.

Add to the compensation estimated under heading I for the reduced vision, 25% for the visual field defect.

IX. Injury to any part of the head, except the eye and its appendages, resulting in a central scotoma of one eye alone.

The visual damage to an eye under this heading must be estimated directly by the size of the resultant scotoma. The following shows the percentage of compensation due for unilateral central scotoma of

Less than 3° = C 40%
3°- 5° = C 60%
5°-10° = C 75%
More than 10° = C 90%

X. Injury to any part of the head, except the eyes and their appendages, resulting in central scotomata of both eyes.

Central scotomata of both eyes present a far more serious problem than the previous and one that entitles the injured to a higher rate of compensation. In practically all cases, the scotomata of retrobulbar origin (such as are included in this heading) are equal and symmetric, and hence the following applies for both eyes:

Central scotomata of less than 3° = C 75%
" " " 3°- 5° = C 100%
" " " 5°-10° = C 150%
" " " more than 10° = C 200%

AN ETIOLOGICAL FACTOR IN TRACHOMA.

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This paper suggests a possible carrier or intermediary host concerned in the transmission of trachoma. It brings together certain facts regarding this disease that would be explained were the hypothesis accepted. It suggests possibilities in etiology.

In the "Annales d'Oculistique," September, 1917, Dr. J. Santos Fernandez, oculist in Cuba, published an article entiled, "Is Trachoma Curable?" in which he draws the conclusion that true trachoma, having its origin in misery and uncleanliness, once developed, is never cured, and that the diagnosis is not rightly made before its evolution. "Let it be as it may," the author says, "it is well known that trachoma is a disease of the poorer classes and it would spontaneously disappear, therefore, if the government would take care of the poor sick."

A long time ago even doctors thought that yellow fever would never disappear from the places where it once developed. In recent years, however, by avoiding the mosquito bite, the disease has been finally eradicated from most places, and at present the Rockefeller Foundation supports a commission whose duty is to extinguish it wherever it may be found. Hygiene, therefore, has gained an important victory over this enemy. The same, we hope, will take place as regards trachoma, because it is far better to prevent the disease than to have to deal with it.

Trachoma in Cuba was introduced by immigration, and notwithstanding rigorous measures taken by the health department in the harbors, the disease spread all over the country.

Here is a matter difficult to explain: the inefficacy of those measures of prevention in countries free from trachoma. It is very difficult also to understand why trachoma is a disease of the poorer classes, who live in bad hygienic conditions.

The specific germ of trachoma is unknown, as likewise is the way contagion can take place. There are some localities where trachoma abundantly prevails without the reason being known; there are other places, such as high altitudes, where very seldom the disease is to be found. Another thing, sometimes in one family we see all but one or two affected, and these never get it.

Admitting that trachoma is inoculated by the body louse a great many questions hitherto unexplained would be answered at once. This is the possibility that we wish to state and justify in the present article.

Pediculus vestimenti is today considered one of the carriers of typhus germs. (See "The Louse Problem," by Horace C. Hall, New York Medical Journal, no. 9, June, 1917, p. 1071.) Nicolle proved in France that typhus fever could be transmitted from monkey to monkey by the body louse; Wilder proved that the disease is transmitted from man to monkey by the same medium. Olitsky, Denzer, and Husk published conclusive evidence concerning the body louse as an etiologic factor in typhus fever.

Recent revelations prove that elimination of vermin of genus pediculidae, known in Brazil as "piolhos," should be regarded as more important than quarantine measures. The vermin belong to the class of hemipteres parasites, pediculina or pediculidae, without wings. They have a suction apparatus by which they cling to the human skin, and animals, aided by small hooks. The general form is elliptical, the larger part of the body consisting in a large

abdomen. The external coat is so hard that when the pediculus is mashed we hear a noise.

They are oviparous and extremely prolific. Their eggs, which mature rapidly, are found attached to the hair and are known as nits (lendeas, in Brazil). There are three species found on man: (1) the pediculus capitis, so named because it is most frequently found in the hair of the head, is the slenderest of the three; (2) the pediculus vestimenti, or body louse, so named because it is most frequently found in the hair of the body and in the folds of the clothing. This latter is less transparent, having a grayish color. Thousands of these vermin are found where uncleanliness prevails, in the homes of poverty and misery. If we can prove that this is the carrier of trachoma, we can understand why trachoma prevails in unhygienic conditions. (3) The last kind is the phthirius pubis or inguinalis, so named because it is most frequently found in the hair of the pubic and perineal region; but it may be found also all over the body.

Pediculus capitis rarely strays from beneath the hair of the head. It feeds upon human blood and may cause eczema, impetigo, and superficial suppuration. The oiliness of the hair is not favorable to the increase of the vermin. It is a known, but inexplicable, fact, mentioned by Horace Hall, that the head louse will not infest the hair of some persons, even after they have been placed on the scalp, as a matter of test.

Should we be conclusively convinced that one of these kinds of vermin is the carrier of trachoma, there will be explained the fact that some persons of one family are not affected. Some persons are unable to rid themselves of the vermin until after the hair is closely clipped. Horace Hall found head lice and crab lice on the same individual, but has never discovered an individual with both body and crab lice.

Pediculus vestimenti lives and deposits its eggs within the folds of the clothing, and is named body louse probably for the reason that rarely is it found on the extremities or on the head. It is a night feeder and difficult to discover within the folds of the garments, other than those in contact with the skin. It will not deposit its eggs on silk clothing or on clothing moistened with perspiration. It is more prolific than the head louse. Due undoubtedly to certain odorous secretions of the skin, certain individuals repel the vermin.

In a family of lousy people, certain individuals will be found free from vermin—a curious fact that would explain, upon the hypothesis of the vermin's being the carrier of trachoma, the cases thought to be due to immunity, of individuals free from trachoma in places where this disease is particularly common. The maturity of the eggs depends upon the feeding, by the female, on human blood.

The elimination of this louse, in the opinion of Horace Hall, means the elimination of typhus fever. All immigrants in a proportion of 80% have eggs and live lice in their clothing and in their baggage.

Immigrants from Mexico can no longer enter the United States without previously getting rid of the louse and its eggs, because certain districts of Mexico are known to be infested with the body louse. The cars and baggage of the immigrants are fumigated with hydrocyanic acid gas. As regards trachoma, we could explain thus the fact that certain localities are free, being free from these vermin carriers.

Here is the possibility that I address to our institutes with the view of having fully discussed the question in which we are so much interested, that of prophylaxis of trachoma. With a desire to be useful to our unfortunate countrymen affected with trachoma we dare to write these lines.

I remember that a well known hygienist of S. Paulo, Brazil, Dr. Guilherme Alvaro, I believe, thought to find in the "powder mosquito" (mosquito polvora, in Brazil) the carrier of trachoma. This hypothesis would not explain, as ours of the body louse, most of the facts I mention. The "mosquito polvora" is not found in many localities infested with trachoma, while the body louse is generally found where

there are persons crowded in one place, living in poor hygienic conditions, and is frequently found in places where trachoma prevails.

If finally proven that the vermin is really the trachoma carrier, the elimination of the disease will soon be an established fact, because the eradication of the vermin is an easy task for the hygienist. Pupils in schools very frequently get trachoma and we know that schools are great distributing points for lice. Trachoma is a destructive inflammation of the conjunctiva with ultimate formation of scar tissue, intractable to all local treatment.

The diagnosis of trachoma, says M. H. Foster (Journal A. M. A., Dec. 1, 1917), is not as easy as some would pretend, for several other conjunctival inflammations may produce granulations closely resembling those of trachoma. While the granulations are very characteristic they may be imitated closely by other diseases of the eye. The one *absolutely characteristic feature of trachoma* is the formation of *scar tissue* and its *typical distribution.*

The examination should be made by everting the upper lid over a bent loop glove buttoner, which is the best instrument for the purpose (Foster).

When pressure is made by this instrument the normal conjunctiva shows a white area, which shades imperceptibly into the normal pink of the surrounding area.

In trachoma the characteristic feature under such conditions is that with the proper pressure uneven, irregular, blotchy patches of white appear, representing scar tissue. Between these areas the conjunctiva remains red.

The influence of seasons of the year in the development of trachoma is a well known fact. Any acute ophthalmia will greatly aid the spread of trachoma. Acute ophthalmias seem due to direct infection from the finger or towel. Flies probably have little to do with their spread. Dust containing infective material is a very fruitful source of infection in acute ophthalmias, especially among the lower classes, who all herd together and very frequently with their animals. Colonel Elliot said that trachoma is largely spread in India by the use of antimony paste, a cosmetic widely used by the more well-to-do classes. One must be on the lookout for mixed infections.

The treatment of trachoma is unsatisfactory at best. Should a bacterial origin be established for trachoma, treatment by vaccines will offer considerable promise of success. By true trachoma I mean that about whose diagnosis there is no doubt. The best treatment known today for true trachoma is, undoubtedly, the excision of the trachoma tissue.

NOTES, CASES AND INSTRUMENTS

In this department will be published brief reports of cases, descriptions of new instruments, and notes or suggestions of interest to workers on ophthalmology.

THE FREQUENCY OF CILIO-RETINAL ARTERIES OCCURRING IN THREE THOUSAND FIVE HUNDRED AND FIFTY-FOUR EYES EXAMINED CONSECUTIVELY.

WALTER R. PARKER, COLONEL, MEDICAL CORPS, N. A.

WASHINGTON, D. C.

The short posterior ciliary arteries after entering the sclera give off branches which form an arterial ring (Zinn's Circle), which surrounds the foramen for the optic nerve. Numerous small branches go from this circle to the optic nerve and its sheath, and anastomose with branches of the central artery of the nerve. It not infrequently happens that the individual branches arising from the scleral ring of Zinn, instead of remaining in the optic nerve, make a bend, leave the nerve and enter the retina.

As usually described, they run toward the macula and supply with blood a small region of the retina lying between the papilla and the macula. These vessels are called cilioretinal arteries. It is by the appearance of the characteristic bend that they are to be differentiated from branches of the central artery, which come off posterior to the disc surface and appear as distinct from the central artery. According to Parsons, cilioretinal arteries were first discovered by Donders and H. Müller, and demonstrated anatomically by Nettleship.

Other regions than that between papilla and macula may be supplied with blood from cilioretinal arteries. They may replace one of the principal branches of the central artery, and rarely more than one may be present in the same eye. They are terminal arteries as shown by cases of embolism of the central artery. In such cases the portion of the retina supplied by these branches will continue to function after the lumen of the central artery is completely closed.

Cilioretinal veins are much rarer than the arteries, due to the fact, according to Leber, that there are no veins in the circle of Zinn. When observed, they are probably of new formation following inflammation (Parsons).

The presence of cilioretinal arteries has been reported in from 7 to 16 per cent of the cases examined. With a view of checking the impression that this anomaly occurred more frequently than was generally reported, it was determined to record their presence or absence in a number of consecutive cases, and tabulate the results obtained.

A series of 3,554 eyes was examined without a break in the continuity of cases. Of this number, 1,235, or 34.75 per cent, showed, as classified from clinical observation alone, the presence of a cilioretinal artery in one of the various locations as shown in the following table:

TABLE SHOWING THE TOTAL NUMBER AND PERCENTAGE OF CILIORETINAL ARTERIES TOGETHER WITH THEIR DISTRIBUTION, FOUND IN 3,554 CONSECUTIVE EXAMINATIONS.

	O. D.		O. S.		Total	
Cilioretinal arteries—	No.	%	No.	%	No.	%
Temporal—Sup. and Inf.	341	19.1	379	21.3	720	20.2
Macular	223	12.5	247	13.3	470	13.2
Nasal	27	1.5	18	1.01	45	1.2
Total	591	13.8	644	18.4	1,235	34.75
Both Temp. and Nasal	7	0.39	4	0.22	11	.3
More than one	49	2.1	54	2.9	103	2.6
Replacing Inf. Temp.	1	...	2	...	3	....
Replacing Sup. Temp.	0	...	1	N4	1	....

It will be noted from the table that the course of the cilioretinal arteries was in the superior and inferior temporal region more often than in the macula region, being 20.2 per cent in the former and 13.2 per cent in the latter. In forty-five instances the artery took a nasal course either in the superior or inferior quadrant = 1.2 per cent.

There were more than one such vessel in one hundred and three cases, 2.6 per cent. The inferior temporal artery was displaced by a cilio-retinal in three eyes and the superior temporal in one eye.

TO PREVENT THE TURNING OF ROUND LENSES.

DAVID W. WELLS, M. D., F. A. C. S.

BOSTON.

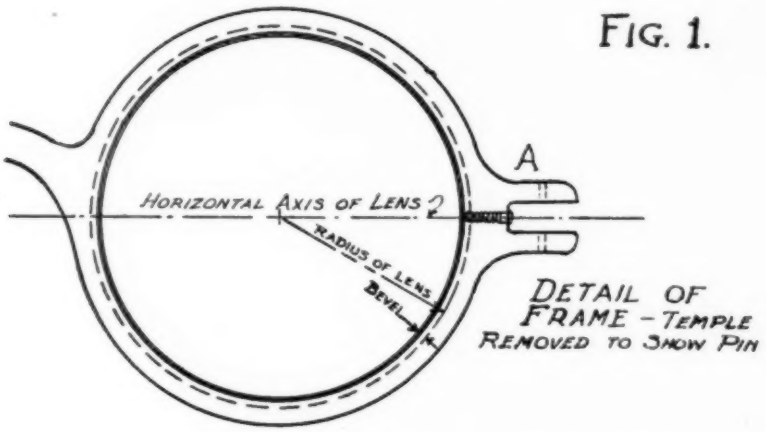
The popularity of round lenses, and the adoption of the new military frame, have emphasized the importance of maintaining the lens in its desired position. Shell and celluloid were the material first to come into general use, shell for the few and celluloid for the many. Since the lens must be "snapped" into these

frames, without opening the joint, it was soon found that unless great care were exercised in securing a perfect fit such lenses were likely to get turned from their original positions. The opticians early discovered this and adopted the plan of scratching each end of the horizontal diameter, expecting that the patient would notice if these marks were out of place. But as the marks are not very conspicuous, and as the importance of frequent examination is not sufficiently emphasized, patients frequently wear their cylinders at wrong axes, not discovering the error until symptoms of eye strain have appeared.

it. This is not entirely satisfactory, as it is likely to discolor the frame and except in the hands of an expert looks a little "botchy." When the "Liberty Frame" appeared the writer took the matter up with the American Optical Company, but they had nothing better to suggest than the drop of solder.

Major Greenwood was consulted and in his paper prepared for the Ophthalmic Section of the American Medical Association advises the drop of solder "if the lens seems loose." In a second communication to the American Optical Company it was suggested that if the arm of the bridge were made to straddle the eye

FIG. 1.



Some years ago the writer, after consulting with a Boston optician, Langton, adopted the plan of taking out the temples and tapping a small screw through the frame, the point of the screw projecting into the groove into which fits the glass. A notch filed in the lens at the corresponding point absolutely secures the position. If the lens happens to come out it cannot be replaced wrong without danger of chipping the glass.

Unfortunately the shell frame is often so frail that tapping in a screw is liable to break it. The writer feels that the ability to secure the lens is of paramount importance, and therefore advises against shell, although the opticians naturally try to push these. The all metal round frame is more difficult to manage. We have overcome the difficulty by melting a bit of soft solder into the hollow wire at the bridge end, and filing the notch for

wire, the groove would be filled up at that point, and necessitate filing a notch in the lens. Incidentally, this would strengthen the frame at its weakest point. The arm of the bridge could be brazed to the *inside* of the eye-wire. They reply that "it is not a very practical manufacturing proposition," and again recommend the drop of solder "when absolutely required."

The concealed wire in celluloid puts the Windsor frame in the same class with the all metal, except that the drop of solder cannot here be used. Here, again, the arm of the bridge could be extended to supply the projection. The writer does not presume to decide the "most practical manufacturing proposition," but it would undoubtedly be forthcoming if there were any general demand for it.

If it is important to discover the exact axis of a correcting cylinder, it is cer-

tainly stupid to allow it to be dispensed so that there is any possibility of its getting wrong. The same importance attaches to sphericals if they happen to be decentered. To leave it to the optician to decide when the pinning or the drop of solder is necessary will never eliminate the trouble. The remedy must be applied in every case, and all that is necessary is for ophthalmologists to demand it.

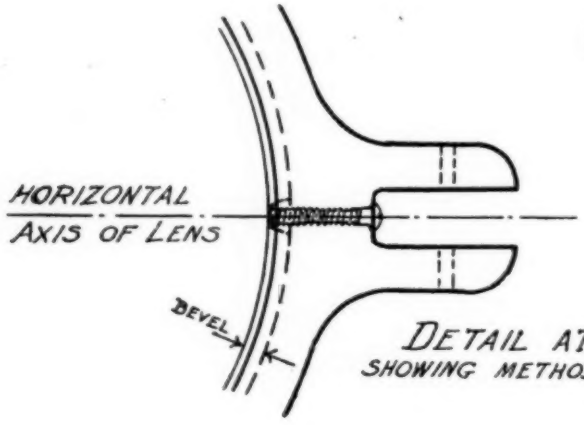


FIG. 2

DETAIL AT "A" FIG. 1
SHOWING METHOD OF PINNING.

My dear colleague, if you agree with me in regard to the importance of this reform, will you please say so at once to the American Optical Company, Southbridge, Mass., as I believe that a few hundred requests from the ophthalmologists of the country would be an irresistible argument.

RETROBULBAR NEURITIS FOLLOWING INFLUENZA.

EDWARD J. BROWN, M. D.

MINNEAPOLIS.

In 1893, when I reported my first case of optic neuritis, the result of influenza (Oph. Record, Vol. II, p. 441), I had no suspicion that the lesion was connected with pressure from a diseased nasal sinus. That others were equally in the dark is shown by reports by Macnamara of London, British Med. Jour., Aug. 1, 1891, Weeks of New York, N. Y. Med. Jour., Aug. 8, 1891, and Gifford of Omaha, Oph. Rec., Vol. II, p. 442, all of whom apparently believed as I did that the neuritis was caused directly by the microbes or toxines of influenza. Macnamara reported cases which had regained perfect vision under mercurial treatment, while Weeks was pessimistic as regards treatment.

My second case ought not perhaps to be included as a sequel of grippe (J. A. M. A., July 1, 1916, p. 34). It was a case of sudden blindness coming on three weeks before I saw the woman, who was incapable of giving a definite history. She had, however, had severe pain in the head and back and had been seen by several specialists, including those of the University dispensary, without any one suspecting that the markedly swollen disc and retina had any relation to nasal sinus disease. When, five years later, she was prevailed upon to have the greatly enlarged middle turbinal and the diseased ethmoid cells removed, there was immediate improvement of the vision.

I have lately had a case in which the history and results of treatment are equally clear. S. H. M., 30, has been under observation for some years. The right eye is normal with vision 20/15 except that the temporal disc is concave, and the color fields contracted, as is also that of the left. The left eye was splashed with embalming fluid when the patient was sixteen; but can hardly have had as much permanent damage from the accident as the family believe. V. O. S. when first seen was 8/200, under scopolamin $+4 \bigcirc +2.50$ cyl. axis $75° = 20/70$. On April 8th of this year he reported that he had been ill with grippe for a week,

and that his vision had been bad for three or four days. There was moderate paresis of the accommodation of both eyes. With his glasses V. O. D. 20/20 +, but smoky. V. O. S. 9/200 and not improved. Ophthalmoscopic examination was negative. There was a paracentral scotoma for colors wholly temporal, with a radius of two and a half degrees. The ethmoids were dark to transillumination and there was some increase of the nasal discharge, with swelling of the turbinals.

After washing out the nose with an alkaline solution and passing a current of hot air through the nares for fifteen minutes, there was a marked improvement with V. O. S. 20/200. Negative pressure followed with hot calomel vapors was also used, and this treatment was given daily. On the 10th I removed the crowded middle turbinal of the left side; and some days later, as the improvement was slow, exenterated the ethmoids by biting through the uncinate process with alligator forceps, and then making successive bites with the instrument held in different positions till the hard wall of the sphenoid was reached. This operation has appealed to me for many years as easier and safer than the use of curets. The patient was also given a 50 per cent calomel ointment for inunction.

On the 23d the color scotoma had disappeared, but vision still remained 20/200. He came in every day with the announcement that vision was clearer, and on the 30th of April he could read 20/70 or as well as before his illness.

PARINAUD'S CONJUNCTIVITIS, WITH REPORT OF A CASE.

T. E. Fuller, M. D., F. A. C. S.

TEXARKANA, ARK.-TEXAS.

Since 1889, when Parinaud first described this form of conjunctivitis, a number of cases have been reported. Prominent among the investigators of the disease in this country are Gifford, Derby and Verhoeff. Parinaud believed the disease to be one of animal origin. One of his cases was a butcher, another resided next to the butcher shop and a third lived in a house where meat was stored. Hoor believes there has been an opportunity for animal contagion in most of the cases. Kirkendall reports a case in a farmer who had treated his horses and cows for a distemper associated with pink eye. Many observers, including Verhoeff and Derby, believe the claim of animal contagion to be unsubstantiated.

Xerosis bacilli, alone or in conjunction with other germs, are believed by some to be the cause of the disease; others regard it as an attenuated form of tuberculosis of the conjunctiva, but the tissue examinations have failed to reveal the characteristics of the anatomic tubercle. In the few cases where animal inoculation was positive, no doubt a case of tuberculosis of the conjunctiva had been mistaken for Parinaud's conjunctivitis.

Some believe that the condition under consideration is not a disease at all, but a symptom complex. Verhoeff has examined a series of 12 cases, which he has studied histologically. He describes the lesions very minutely and disproves the assertion that there is nothing characteristic in the histology of Parinaud's conjunctivitis. He has also succeeded in isolating a hitherto undescribed organism, which he classes as a leptothrix. He regards this as the etiologic factor, and produces the evidence to prove that Parinaud's conjunctivitis is a distinct entity. The disease occurs only in the temperate zone and is most common in autumn. Both sexes are susceptible and all ages liable. It is most always unilateral.

The onset is acute with constitutional symptoms, such as fever, malaise, etc. The preauricular, parotid and sometimes the cervical glands are swollen and tender and not infrequently suppurate. Occasionally the disease is accompanied by acute tonsillitis. In the inflamed conjunctiva, reddish or yellowish granulations develop. These may grow so large as to produce considerable swelling. In some cases superficial ulcers form on these granulations. With the greatly swollen lids and constitutional symptoms the disease presents a very formidable appearance, but the outcome is uniformly good. The course varies from a few weeks to a few months, but recovery without injury to vision is the rule.

The diseases most likely to be confused with Parinaud's conjunctivitis are squir-

rel plague ophthalmia, sporotrichosis and tuberculosis of the conjunctiva; and possibly in some cases trachoma. The use of the microscope, tuberculin tests, and, if necessary, animal inoculation will establish the nature of the condition. The course of the disease is not very greatly influenced by treatment; silver nitrat or the newer silver salts may be used. Excision of the granulations is highly recommended; frequent bathing of the eyes with boric acid or other antiseptic solution should be practiced. Sinclair and Sherman used a vaccine in one case, but the patient did not remain under observation long enough for a definite conclusion to be reached.

Report of a Case.

The patient was a male, age 36, laborer at a saw mill, with nothing of interest in his family history. His health had been good previous to the beginning of the present trouble. This began some two or three weeks before when he caught what is commonly called a dog tick, and squeezed it between his fingers. The contents of the tick's body flew into his right eye. This began at once to inflame and in 24 hours his lids were greatly swollen. He was suffering considerable pain, and his temperature was 104.5°. The glands of the face and neck were enlarged and tender. His constitutional symptoms subsided in a few days, but there was little improvement in the condition of his eye.

At the time of the examination his preauricular gland, his parotid and all of the cervical glands of the anterior group were enlarged and very tender, the skin over them being red and glossy. There was no fluctuation. The right upper lid was swollen and edematous, there was no involvement of the lacrimal gland. The upper palpebral conjunctiva was covered with large irregular nodules, on the summit of many of these superficial ulcers were to be seen. The conjunctiva of the globe and lower lid was injected, but showed nothing characteristic. There was a moderate mucopurulent discharge, the cornea was transparent, a smear taken at this time showed only some xerosis bacilli and a few cocci.

The case was diagnosed as one of Parinaud's conjunctivitis, and the patient was sent to the hospital, put on a generous diet and a boric acid bath and yellow oxid ointment prescribed. Under this treatment he improved slowly but steadily. He was allowed to return home before his cure was complete, but was assured that he would entirely recover within a few weeks.

The points of particular interest in this case were:

First. The unusual accident that apparently caused the attack; whether this may be taken as evidence to uphold the belief of the animal origin of the disease, I cannot say.

Secondly. The presence of extensive ulcerations.

Matthewson says these have occurred in only 12 per cent of the reported cases. These ulcers were not deep, as in squirrel plague ophthalmia.

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SOCIETY PROCEEDINGS

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Session 1918, May 2-4, London.

The Society held its annual Congress on the three days, May 2nd to 4th, mainly at the rooms of the Royal Society of Medicine; and it was well attended, despite the war. The chair was occupied at all the meetings by the president, Mr. E. Treacher Collins, F. R. C. S. A special discussion was held on the second day at the Metropolitan Asylums Board Schools for Ophthalmia, at Swanley, Kent, on "Contagious Diseases of the Conjunctiva." (See p. 503.)

A special meeting of opthalmologists from various parts of the Kingdom for the purpose of forming a Council of Ophthalmologists to watch over matters appertaining to the specialty was also largely attended by members of the Society. The decision to form such Council was unanimous, and the speeches delivered in support of the scheme strongly urged special training of men before they were allowed to take up the work of ophthalmology. It was decided that the Council shall be constituted as follows: All the past and present presidents of the Ophthalmological Society of the United Kingdom and of the Section of Ophthalmology, Royal Society of Medicine (to be permanent members), four members (elected annually) from the Councils of each of these bodies, and one representative of the Oxford Ophthalmological Congress.

The President's Address.

In his inaugural address, Mr. Collins said this was not a Society which awoke into activity on three days in the year, and was dormant during the remaining 362. There were always arising matters of ophthalmologic interest which needed watching, such as the visual standards for the Army and other services, and the urging forward of the supply to the Army of the visor designed by Captain Cruise for the saving of much damage to eyes at the front from the dispersion of small particles following explosions. The War Office had recently created the important post of Consulting Ophthalmic Surgeon to the Forces at Home, and he expressed the Society's congratulations to Colonel Herbert Parsons on being chosen to fill it.

With regard to the present outlook, numbers of men, during the war, were transferred from countries in which contagious ophthalmia was perennially rife to others in which the disease was of only sporadic occurrence, and, conversely, many who had no idea of contagious eye disease had been sent into districts where 90 per cent of the population had had active trachoma at some time. As these men would, in due time, return to mix with their kith and kin, he thought some concerted action should be taken with the view of preventing a repetition of the general infection of the population which occurred from the troops to this country from Egypt after the Napoleonic wars.

Now that members of the specialty in the United Kingdom had accomplished, through having only one journal, and through the affiliation of various of the provincial societies with this society, a much greater cohesion, representations in regard to the nation's eyesight would come with much greater force than in the past. There was still, he said, much room for improvement on such matters as safeguarding the eyesight of children from the strain incidental to school life, the provision of special curricula for short-sighted pupils, reduction of cases of blindness following ophthalmia neonatorum, and the setting up of minimal standards for certain occupations in which defective sight was dangerous. The Nettleship Prize and Gold Medal had been awarded to Lt.-Colonel Gordon Holmes, M. D., for his researches on disturbances of vision associated with cerebral lesions. The Bowman Lecture for 1919 would be delivered by Dr. Morax of Paris.

He followed with a scientific contribution on "Effects of Hypotony in Rabbits' Eyes."

Histology of the Trephined Disc.

LT.-COL. R. H. ELLIOT, I. M. S., read "A Contribution to the Histology of the Trephined Disc," and supplemented it by a number of slides. For the best results, he said, the discs must be cut strictly in the meridional plane of the eye. For a trephining operation to be successful, it was essential for a portion of Descemet's membrane, or of the pectinate ligament, or both, to be completely removed. In every glaucomatous case he had examined he found thickenings on Descemet's membrane, at the point where it was about to break up to form the pectinate ligament, and always on the posterior surface. For that reason he concluded they represented the products of the activity of the endothelial layer of Descemet's membrane. Possibly their occurrence bore no relationship to the glaucomatous process, but they might be a result of the chronic congestion attending long-continued high pressure of the eye.

DISCUSSION.—Capt. T. Henderson regarded Descemet's membrane as a deposit due to the activity of the epithelial lining of the anterior chamber. The membrane in the fetal eye of both man and animals was very inconspicuous, and became larger and more prominent as age advanced. The anatomic cause at the bottom of glaucoma he considered was fibrous degeneration of the cribriform ligament.

The president said that in only one zone of the eye could a true filtering scar be secured, namely, as Col. Elliot said, at the sclero-corneal margin. The operator must keep well forward, and aim at getting away a complete circle of Descemet's membrane.

Capt. Cruise did not consider it necessary, in order to secure a good filtering scar, to excise a circular portion of Descemet's membrane. He had derived better results by employing a modification of Fergus' sclerotomy flaps, by which incision of Descemet's membrane was avoided.

Mr. Hosford agreed with Mr. Cruise, and expressed his preference for a modified Lagrange operation.

Herpes Zoster Affecting the Ciliary Nerves.

MR. GEORGE THOMPSON read a paper describing four cases of herpes zoster affecting the ciliary nerves. Several members discussed the paper.

Visor to Protect Eyes.

CAPT. R. R. CRUISE exhibited a new and much improved design of Army visor. Last year he showed the pattern he had then evolved, and the Society passed a resolution of cordial endorsement, urging the authorities to adopt it and supply as many as possible, owing to the proved saving of eyesight resulting from its use. As a result of the criticisms received following hard wear under service conditions of the previous design, he evolved the present pattern, which meets all objections, and is regarded as fool-proof. A central strut keeps the chain mail away from the nose, and forms the fulcrum for the action which places the mail on top of the helmet when not in use, and lowers it for use, the change being effected in one second. Its use does not interfere with accuracy in shooting, and in bright sunlight it sensibly modifies the glare. One of the objections urged against the former kind was that the rattling of the chains prevented silent patrol work. In the new form there are no chains to rattle, the movements being actuated by springs.

DISCUSSION.—Col. Lister considered the design a beautiful one, but the authorities evinced a surprising apathy about adopting it universally. He thought there would be an objection to wearing this visor in conjunction with the gas mask, especially in hot weather. Incidentally he remarked on the inability of many Army medical officers to recognize perforations in the eyes; some seemed not to know how to set about the examination.

Capt. Cruise replied that the visor was not needed so much when the gas mask was in position, as the celluloid eyepiece would stop many of the small particles which caused so much eye damage in battle. He was glad to be able to say that there was now a good deal of evidence of growing enthusiasm in favor of the mask among combatant officers.

Tests for Thresholds of Light and Color.

MR. GEORGE YOUNG read a contribution on clinical tests for the threshold of light and color. Using standard inks as his basis, he produced fixed dilutions of over a thousand degrees and placed a circle of the color on each leaf of a small album. These leaves were fairly rapidly turned in the view of the patient. He said the album had enabled him to rapidly arrive at knowledge as to scotoma in any patient, and many observations had established a certain relationship between color-perception and some eye diseases. For instance, in the retinitis of pregnancy perception for yellow was markedly reduced, but not in the albuminuric retinitis of trench fever.

Dr. W. W. Sinclair spoke highly of the method, and confirmed some of Mr. Young's results.

Blepharoplasty.

In the afternoon, a discussion was held on plastic operations on the eyelids. The chief item was a demonstration of numerous patients brought from Sidcup special hospital by Major Gillies, R. A. M. C., on whom various forms of plastic operation had been performed. In association with his paper opening the subject, he showed, by means of the epidiascope, numerous photographs illustrating the successive operative stages in approximating the appearance of these unfortunate men to that of ordinary members of the community. A number of American and British surgeons were present, some of whom contributed to the discussion, at the end of which a vote of thanks to Major Gillies was accorded by acclamation.

Contagious Diseases of the Conjunctiva.

MAJOR J. F. CUNNINGHAM and CAPT. J. WHARTON had written an instructive paper on the subject which was read by Colonel Lister. The authors stated that the question of trachoma and ordinary conjunctivitis arose owing to the introduction of colored units into France. Nineteen per cent of the Egyptians brought into that country had active trachoma, and 9 per cent of the Chinese. The infected cases were separated from men clean in this respect and were kept isolated from them throughout. Up to the date of writing, the authors had no knowledge of the disease having spread from these importations either to our own troops or to the civil population. It was satisfactory to note that the sickness-hours among the infected companies did not exceed those in clean companies. The importation of men showing trachomatous granulations or acute conjunctivitis had been stopped.

The chief object of the regular treatment administered was to keep the men fit for their work, and to prevent the spread of the disease. Camps for both Chinese and Egyptian labor companies were enclosed, and, except for work, the men were not allowed out of their camps. Under no circumstances was a man transferred from an infected to a clean company. Less than one man per month had been repatriated in consequence of the disease. The treatment carried out was the universal drop one. Once a day the men squatted in rows, drew down their lower lids, and while they looked upward a native orderly passed rapidly along and dropped two drops into each eye of the following lotion: Acid bor. gr. X, zn. sulph. gr. ii, water to one fl. oz. In this way, a whole company could be treated in about twenty minutes.

Col. Lister testified to the fine work done in this connection by the authors of the paper, and all the ophthalmic surgeons who assisted. Had not the men on their entry into the country been properly classified and segregated, the whole scheme would have failed.

THE PRESIDENT, who is consulting medical officer to the Swanley School, gave a short account of the work done there. The qualification for admission was very wide; all children having a discharge from the eyes being capable of being conveyed to the eyes of another child were eligible for admission. Since the institution was inaugurated in 1903, 7,163 had been inmates, and of these 1,697 were diagnosed as suffering from *trachoma,* and 5,466 other eye affections.

The trachoma cases are kept separate from the others. The arrangements for washing, bathing, sleeping and treatment were most scrupulous, and the appearance and brightness of the little colony was very obvious to the least observant.

The impression of the President was that trachoma was caused by an organism of ultramicroscopic dimensions, which did not seem to be transferred by air, but through the medium of the moist discharges. An exacerbation of trachomatous manifestations seemed always to be associated with the complication produced by some well known organism, such as the gonococcus. He considered that trachoma was not found anywhere but in the conjunctiva because of the thinness of the covering epithelium and the presence beneath the epithelium of delicate loose subepithelial areolar tissue. In trachomatous pannus there was a new formation of blood vessels and tissue, and this pannus occurred in the later stages of the disease, when the corneal epithelium had been softened by continuous chronic discharge. Very few of the children in this school had suffered from disease in the lacrimal passages; certainly not more than children who had ordinary conjunctivitis. Sometimes the areolar tissue was replaced by fibrous tissue, and then the disease was arrested. A very effective form of treatment was by carbon dioxid snow. (This was demonstrated to members by the Medical Officer, Mr. Tyrrell.)

Discussion.—Mr. Tyrrell, in a contribution to the discussion, agreed that the application of CO_2 snow was one of the most successful methods of treating trachoma when the follicles were over the tarsus. When the schools were first opened, X-rays were used, but a difficulty was that the amount of reaction could not be gauged beforehand.

Mr. M. S. Mayou gave an exposition, aided by color diagrams, of his conception of the pathology of the disease, after which the discussion became general.

Variable Paralyses of Ocular Muscles.

In the afternoon Colonel Lister demonstrated, at the Museum of the Royal College of Surgeons of England, a number of specimens of peculiar interest to the specialty, and the evening session was a clinical one. On the Saturday morning a number of interesting cases were shown and discussed at the National Hospital for the Paralyzed. Dr. James Taylor, one of the physicians there, demonstrated several cases in which a variable paralysis of ocular muscles was the chief feature. Usually the paralysis affected chiefly branches of the third nerve, and in some instances it was bilateral. He regarded them as instances of myasthenia affecting only the ocular muscles. Cases and contributions by Dr. F. E. Batten, Mr. Leslie Paton and Dr. Kinnier Wilson also formed part of a very interesting visit.

During the course of the Congress, a Museum, under the direction of Mr. A. C. Hudson, was open, in a room adjoining the discussion chamber.

SECTION ON OPHTHALMOLOGY, COLLEGE OF PHYSICIANS OF PHILADELPHIA.

January 17, 1918.

Dr. S. Lewis Ziegler, Acting Chairman.

Cysts of Iris.

Dr. P. N. K. Schwenk showed a man, aged twenty-four years, married, with two cysts of the iris in the right eye. One was of a semitransparent color with a few iris fibers crossing its anterior surface, measuring about three-sixteenths of an inch, slightly flattened by contact with posterior surface of the cornea, and situated at 10 o'clock. The other was highly pigmented, having denser iris tissue for its wall and about two-sixteenths of an inch in diameter, occupying 4 o'clock position. The two projected edges were nearly in contact occluding the lower three-quarters of the pupil, therefore interfering with vision. The patient still had most of two-fifths vision with glass correction of $+ 12$ S $\bigcirc + 2$ cylinder axis 90° in an aphakic eye. This pa-

tient first came under Dr. Schwenk's observation at Wills Hospital on July 13, 1916, when the following history was obtained: When thirteen years old he was struck in the left eye by a ruler in the hands of his teacher which caused blindness of that eye. Several months later a boy threw a stone at him which hit him in the right eye, causing impaired vision.

Examination showed slight convergence of globes, but muscular movements were normal. Both corneas normal. Left pupil 2 mm. and right 4 mm. Left eye media clear, large patch of choroidal atrophy with pigmentation in macular region and vision *nil.*

Right eye pupil 4 mm., slight reflex action, iris oscillating, lens dislocated up and out, at 10 o'clock, slightly swollen, T +. S. — 3 = 6/15 vision. November 11, 1916, returned with deep ciliary injection, cornea steamy, keratitis punctata, pupil widely dilated, T + 1., fundus reflex but no details. Alteratives were given and he was advised to have the lens removed, but he desired to go home and consult his family.

December 5, 1916, the patient returned with the ball less injected but having a glaucomatous expression. In consultation with Dr. Zentmayer, removal of dislocated lens was confirmed. Punctate deposits on posterior wall of cornea were pronounced and T + 2. The patient was admitted to the ward of the hospital and ordered to be prepared for operation two days later. On December 16, 1916, general anesthesia was given when the lens was removed after an iridectomy. Some lens cortex remained, but it was deemed advisable not to attempt its removal. The patient made an uneventful recovery and was discharged on December 20, 1916, with vision of 20/50 with a + 12 S ⌒ + 2 cyl. ax. 90° glass. December 1, 1917, nearly one year after lens extraction, patient returned with a clear cornea, broad iridectomy, at 12 o'clock, some unabsorbed cortical still present. Anterior chamber normal, eye quiet, some opaque capsule. Advised to return for capsulotomy. Iodides were given. May 28, 1917, a web-like opacity showed in pupillary area but eye quiet.

October 9, 1917, patient returned with a large cyst of iris, at 4 o'clock, and a smaller one at 11 o'clock.

On October 11, a broad needle or keratome was passed from 4 o'clock, at limbus of cornea into cyst, point of needle extending through cyst wall into pupillary area evacuating contents of cyst. With a Tyrrell hook the cyst wall was engaged and cut off. When Dr. Schwenk looked for the other cyst it had collapsed and could not be found, showing that there must have been a common wall connection.

Cysts of the iris are very rare, and Dr. Schwenk considered the case of sufficient interest to show before the section. The cause is supposed to be an invagination of epithelium caused by trauma or operation.

Recurrent Pterygium.

Dr. J. B. Turner showed a man, aged forty years, who had during a period of ten years, eleven operations for recurrent pterygium. The conjunctiva of the lids becoming involved, the eye was enucleated six months ago, and there has been no return of the disease which the pathologist classed as a slow-growing carcinoma.

Discussion.—Dr. Zentmayer said that malignant growths starting from pterygia were rare but not heretofore unknown. It would seem probable that in these cases there is an element of malignancy latent which is excited to activity by the operation for removal of the growth.

Orbital Tumor.

Dr. Wm. Campbell Posey presented the notes of 3 cases of orbital tumor. Case I was that of a woman aged twenty-seven years, with marked exophthalmus in the right eye, the exophthalmus which had appeared when the patient was about seven years old, being caused apparently by a hard, smooth mass, which could be plainly felt under the orbital rim at the upper, outer part of that cavity. Notwithstanding the displacement of the globe, ocular movements were good in all directions. Vision in the right eye was normal

and there was no limitation in the field of vision. X-ray examinations of the sinuses negative. Incision made over the most prominent portion of the mass gave escape to a large quantity of thick viscid material, the mass evidently being of a *dermoid* nature.

CASE II.—This was a case of *sarcoma of the orbit* in a man aged fifty-four years, who had been struck on the head and eye some ten years previously by falling timber. The affected eye had been enucleated elsewhere some four years previously, perhaps for sarcoma of the choroid, though the cause of blindness in the organ and the reason for its removal were unobtainable. The recurrence of the growth in the orbit, if such was the sequence, presented an unusual form, the tumor appearing as a firm black rounded mass, which occupied the position of the eyeball and extended downward and forward, resembling in its position and form a microphthalmic eye with attached cyst below. The mass was removed *in toto* by Dr. J. Milton Griscom in the absence of Dr. Posey, and the contents of the orbit eviscerated. Copious hemorrhage attended the operation and recurred at each dressing. Two weeks after the operation the orbit was subjected to a thorough electrical desiccation treatment by Dr. Clark, since which time the hemorrhages have ceased, and the orbit now shows signs of being filled in with newly formed tissue.

CASE III.—Female, aged eighteen years. Following an attack of typhoid fever when aged twelve years, glands upon the back part and upon the left side of her neck became swollen. This condition has persisted ever since. Health otherwise good. Family history negative. About a year ago noticed that the left eye was more prominent. This condition advanced until four months ago, when the protrusion of the eyeball became stationary. Upon examination, left eye is moderately proptosed down and somewhat out. Under the upper, outer part of the orbit a firm, slightly movable mass is felt, about the size of a large almond. Ocular movements limited, but no neuritis. X-ray examination of the sinuses negative. Incision made in upper, outer part of the orbit, just over the mass, revealing a more or less oval, firm encapsulated growth, easily removable and without connection to any important intraorbital structures. Rapid convalescence with slight scarring. Macroscopic appearance of growth suggests sarcoma. Microscopic report not yet received.

DISCUSSION.—Dr. Shumway said that in exenteration of the orbit in 2 cases at the Philadelphia General Hospital, one for recurrent carcinoma of the anterior part of the eyeball, and the other for sarcoma of the choroid, with extension into the orbit thru the sclera, he had asked a member of the X-ray department of the hospital to be present at the operations. After removal of the orbital contents the remaining tissue at the bottom of the orbits had been charred by the application of the desiccation spark, and no recurrence has been noted. In one case bleeding from the ophthalmic artery had been controlled by passing the current downward through the hemostatic forceps, which had been placed upon the cut vessel, and there had been no subsequent bleeding. He thought the method made the operation easier, and helped to prevent recurrence.

Variable Findings in Ocular X-Ray Localization.

DR. G. ORAM RING presented for study a man who had been struck in the left eye with a piece of steel ten weeks ago, the case applying at the Protestant Episcopal Hospital for treatment about five weeks after the accident to the eye.

The vision in O. D. is 20/25 and in O. S. 20/150.

At the time of the initial examination the eye was white and quiet, with evidence suggestive of penetration of the ball at two different points, a small central opacity at the pole of the cornea, with a corresponding spot on the lens capsule with traumatic cataract; and a second linear corneal scar down and in, with corresponding penetration of the iris just below the lower and inner pupillary border which was the

site of a broad posterior synechia. No satisfactory view of the fundus could be made because of the lens haze. Perception and projection were good. Upon strong illumination of the good eye, slight lacrimation was present and there was some obscuration of the upper, inner and lower edges of the disk.

An immediate X-ray picture showed the presence of only one foreign body, which was located 28 mm. behind the corneal pole, 3 mm. to the nasal side and 2 mm. above the horizontal plane, approximately in the position of the optic nerve. Inasmuch as the sensitiveness of the right eye rapidly subsided, and assuming that the foreign body was behind the eyeball, it was proposed to wait until the foreign body had probably firmly incased itself in exudate.

At the end of about two months an upward iridectomy was done with the intention of later extracting the lens. The view thus made possible through the lens periphery showed the presence of a small mass of exudate in the posterior part of the vitreous with a dark center which immediately suggested the importance of a second X-ray picture. This was made by Dr. H. K. Pancoast of the University of Pennsylvania. Still but one foreign body was located, but this time in the eyeball 21 mm. back of the pole of the cornea and 3 mm. to the nasal side and 2½ mm. above the horizontal plane.

In view of this second finding it was determined to proceed no further with operative intervention unless suggested by sympathetic symptoms.

This is the second case within a year that the author has been led astray by faulty localization, although it must be kept in mind that the clinical appearance pointed to the presence of two foreign bodies, whereas the X-ray plate in each case indicated one but in different positions. Dr. Ring's experience with the X-ray localization by the "Sweet Method" on the whole has been most satisfying and he proposes to have further X-ray studies in the hope of shedding additional light upon this rather unique case.

Discussion.—Dr. S. Lewis Ziegler spoke of the possibility of having two foreign bodies in the same eye, only one of which showed on X-ray examination. He spoke of having seen such a case with cataract and siderosis, in which pain was elicited on application of the magnet. Upon operation a foreign body was removed with the lens, and a second foreign body extracted with the magnet through an incision over the ciliary body.

Vernal Conjunctivitis Greatly Improved by Radium Treatment.

Dr. Edward A. Shumway reported a case as already published in this journal (p. 404).

J. Milton Griscom, M. D.,
Clerk.

Meeting of February 21, 1918.

Dr. S. Lewis Ziegler, Acting Chairman.

Tumor of the Orbit.

Dr. W. C. Posey exhibited a case from whom he had recently removed a tumor of the orbit. The growth had occasioned marked exophthalmos, the globe being proptosed 11 mm. in front of its fellow. The incision was made as for the Krönlein operation, but the tumor, which consisted of an adenoma the size of a horse chestnut, was removed without interference with the bony wall of the orbit. Convalescence had been speedy, and now, three weeks after the operation, there was scarcely any evidence of the previous existence of the growth beyond a slight drooping of the outer part of the lid.

Blindness from Ischemia of the Retina.

Dr. Arnold Knapp, by invitation, reported on a number of unusual cases illustrating a definite group showing occlusion of the central retinal artery in which a cause cannot be found; this group is said to constitute about 30 per cent of the cases. In addition to these a case of embolism of the central retinal artery was reported occurring in a child, aged ten years, who had suffered from acute rheumatic endocarditis.

The following cases constituted the subject of the paper:

CASE I.—Embolism of the retinal artery in a child, aged eight years, who suffered from chorea.

CASE II.—Two cases of frequent obscurations which led to a permanent occlusion of one of the branches of the retinal artery. In both of these a most careful general medical examination was made without finding any definite cause, except in the first an anemia secondary to pulmonary tuberculosis, and in the second six abscessed teeth.

CASE III.—A temporary obstruction of the retinal circulation which was observed during an attack. The cause for this seemed to be an anomaly of the vessels at the optic disk and a momentarily reduced general blood pressure.

CASES IV AND V—Cases of closure of the central retinal artery with loss of sight of unquestionably infectious nature. The first a patient, who suffered from chronic streptococcus viridans septicemia, lost the sight in one eye with the picture of an obstruction of the retinal artery with some exudates and hemorrhages in the retina. In the second case the infection was obscure and both eyes were affected, one after the other, with subsequent and total blindness; the ocular diagnosis being a retrobulbar neuritis with involvement of the central retinal artery. The optic nerve head showed distinct inflammatory changes; there was a central scotoma in the right eye, retinal exudates and a shutting off of the retinal circulation. This patient, who also suffered from endocarditis, originally had an operation upon her antrum and had been running a regular evening rise of temperature for months.

DISCUSSION.—Dr. Zentmayer said he feared that he could not say anything in elucidation of the group of interesting cases Dr. Knapp had reported. He had at that time at Wills Hospital a case that belonged to the first group, that is, those occurring in children. The patient was a boy, aged twelve years, who suddenly lost the vision of his right eye. At first there was the picture of complete obstruction of the trunk of the central artery due doubtless to an embolus, as the boy has a valvular lesion of the heart. After a few days there appeared along the course of the inferior temporal vessel a large patch of exudative retinitis. It would seem probable that the embolus broke up and was carried into the branch and that it was septic. Many present probably recalled seeing Dr. Harbridge's case of spasm of the central artery of the retina in a man, aged fifty years. These attacks followed stooping and recurred on two successive days, lasting from thirty seconds to two minutes. The attacks ceased after the use of free purgation and nitrit of amyl. It was likely that the cause of the spasm of the vessel was an autoinfection just as in uremia we have a spasm of the cerebral vessels. Given the early changes of arteriosclerosis in the retinal circulation with superadded a low blood pressure and you have favorable conditions for the formation of a thrombus.

The condition of ischemia of the retina as a complication of mumps suggests the possibility of this being in the nature of the recently described symptom complex of uveoparotitis in which a uveitis sometimes precedes, sometimes following the parotitis, in the first instance it being a question whether both the uveitis and the parotitis are not due to a common toxic cause. It might be that the obstruction of the central artery was of a metastatic type.

Burton Chance, in commenting upon Dr. Knapp's paper, detailed a case of widespread retinal ischemia in the left eye of a woman in the sixth month of her fifth pregnancy, prior to which her sight had been unaffected. The ischemia involved the area supplied by several branches of the central vessel, as depicted in a sketch he showed made by the late Miss Washington. The case went to term safely, but after three months the circulation was found to have become completely restored, and the sight as before the sudden loss. In addition, Captain Chance referred to the frequent inconsistency between the degrees of intracranial vascular pressure and the appearance of the ret-

ina. He recalled cases of superturgid cerebral vessels as found postmortem, in which at no time up to within a very short period before dissolution were there evidences of abnormal vascularity within the globes. In this connection he had in mind the findings in a number of fatal cases of cerebrospinal meningitis which had been under his observation in the recent epidemic at Camp Jackson.

Dr. Ziegler suggested that some of the cases of spasm of the retinal vessels may be due to disturbance of the parathyroids, and stated that he had seen a case of spasm which he considered due to this cause.

Concussion of Eye and Removal of Two Bullets from Orbit.

DR. HOWARD F. HANSELL reported this case. See p. 426 for full report.

Perforation of the Cornea Persisting for Eight Months.

Dr. Hansell spoke of this case, which has also been published in this journal, p. 426.

DISCUSSION.—Last year Dr. Zentmayer showed before the Section a woman who had had a corneal fistula for nine months. Closure was brought about by means of the Kuhnt keratoconjunctivoplasty. As in most of these cases an iridectomy is necessary, the blade of the keratome may be kept within the anterior chamber and used as a support upon which to curette the fistula.

Burton Chance said Dr. Hansell's cases of persistent perforation of the cornea brought to his memory several cases of tardy closing of the wound after cataract extraction of which he had had the care when resident at Wills Hospital. At that time, when he saw so frequently purulent infection after wounds of the globe, he had wondered how so long a delay of closure was not accompanied by suppurative processes.

Dr. Ziegler called attention to the fact that he had previously related a case of corneal fistula of long standing that had been successfully closed by a corneal transplantation.

Opticociliary Vessel.

DR. A. C. SAUTTER exhibited a case of congenital opticociliary vein, in the right eye of a man aged thirty-three years. There was no history of any previous ocular inflammation, excepting a mild traumatic conjunctivitis about sixteen years ago.

Vision in the right eye equalled 5/6; in the left 5/5. The anterior ocular segment of each eye appeared free from any abnormalities.

Ophthalmoscopic examination of the right eye revealed clear media, a nearly circular healthy disk with a small, slightly eccentric physiologic excavation. At the upper temporal border of the disk a cilioretinal artery was visible and at the lower temporal portion could be seen a vessel running apparently from the papillary vein outward and downward over the papilla to the disk margin where it abruptly disappeared. It was somewhat wider than the cilioretinal vessel present above, its widest portion being at the disk margin. In color it resembled an artery more than a vein but showed no vessel reflex. This vessel was crossed at about its inner third by a very small branch of the papillary vein. There was slight pulsation of the retinal veins where they entered the excavation but no pulsation of the anomalous vessel. Pressure upon the eyeball caused increased pulsation of the retinal veins with a blanching of the venous structures within the excavation including the central portion of the anomalous vessel, pulsation of which, however, could not be proved with certainty.

Otherwise the fundus showed no abnormal changes and nothing unusual was noted in the fundus of the fellow eye. Refraction in each eye was a low hyperopic astigmatism.

The writer was able to find in the literature but 12 cases of this congenital anomaly, 2 of which were arteries. These cases have been generally attributed to congenital dilation of one of the capillary anastomoses normally existing between the retinal and ciliary circulations. The writer's case resembles closely the case reported by Shoemaker in 1909, the relative location, size and color of the vessel being the same. While pulsation is absent,

it apparently communicates with a retinal vein. The collapse of the vessel in conjunction with other venous branches upon pressure on the globe would seem conclusive evidence in favor of considering it part of the venous circulation, but whether the direction of the blood stream is the same as in the retinal veins seems impossible to determine with the ordinary methods of examination.

Essential Atrophy of the Iris.

DR. WILLIAM ZENTMAYER reported the case of A. B., aged twenty-three years; spinner, of Polish parentage; parents living and well; two brothers, three sisters living and well; seven brothers and sisters dead, all in childhood. The patient was poorly nourished; had measles when seven years of age; no other illness except carbuncle three years ago. Suffered severe headaches about every three weeks. Seven or eight months ago he noticed halos around light only at night. Since fall the sight had been foggy in the morning. No pain. The eye was never inflamed. Never wore glasses. Wassermann, negative. Von Pirquet, strongly positive. Vision: R. E., 5/5; L. E., —0.75 ⊃ —2.00 cy. 90ç =5/8. Tension: R. E., 18 mm.; L. E., 30 mm. R. E., fundus normal; L. E., cornea hazy, no fundus changes. Field was full for form but the color fields were contracted. R. E., cornea hazy. The iris presented in its nasal quadrant a partial atrophy of its stroma, but as yet there were no holes.

In 1913 Dr. Zentmayer exhibited before the Section a similar case in a woman, aged twenty-three years, in whom the atrophy advanced in the short time the patient was under observation (seven months) from a few small holes to an almost complete destruction of the nasal half of the iris. In 1915, before the American Ophthalmological Society, de Schweinitz reported a case almost identical with Dr. Zentmayer's first case and referred to two other very similar cases, one by Wood and one by Harms. In his own case the patient was a female, aged twenty-three years, who presented a low nervous resistance probably due to tuberculosis.

DISCUSSION.—Commenting on the suggestion that the changes were probably due to alterations in the vessels, Dr. de Schweinitz said that no explanation was offered as to the nature of these changes or how they caused the atrophy. He offered as a possible explanation the action of an autotoxic agent. In the first number of the AMERICAN JOURNAL OF OPHTHALMOLOGY Feingold records the pathologic findings in a case somewhat like these. He found slight infiltration and pigmentation around Schlemm's canal. The defects in the iris were limited to its ciliary portion and consisted of atrophy of all of its layers and degenerative changes in the bloodvessels. In explanation of these alterations his thoughts turned to possible embryonic malformation of the vessels. As in Wood's case there was cavernous degeneration of the optic nerve. In a small area of the retina, on the temporal side of the papilla, there were large cells occupying the position of the ganglion cells. Their nature was not determined. He concludes that his case offers no positive explanation for the clinical entity although some features could be interpreted as that a congenital vascular disturbance in the neighborhood of the smaller circle may have induced the changes in the iris.

Zonular Opacity of the Cornea.

DR. WILLIAM ZENTMAYER presented the case of G. B., aged sixty-two years, painter. No personal or family history bearing on the present eye condition. Last spring on being tested for glasses he discovered that with the right eye he could see only the outer half of an object looked at. The eye had never been inflamed nor painful but occasionally watered. For the past five weeks he had noticed an increasing dimness of vision in the left eye. Vision: R. E., blind; L. E., 5/6. Tension: R. E., 50 mm.; L. E., 12 mm. The R. E. presented a dense opacity extending horizontally across the lower third of the cornea with a temporal and nasal upward extension on either

side of the pupil. The overlying epithelium was roughened and in places vesicular. The iris was bound down to the anterior capsule of the lens, was discolored and had large blood-bearing vessels crossing its surface at right angles to the radial fibers. The cornea was anesthetic. In the left eye there was a zonular band symmetrical with that in the right eye but much less dense and the overlying epithelium still uninvolved. By oblique illumination the opacity was almost ground glass in density and was uniform except for a small, comparatively clear spot near the middle. The sensibility of the cornea was diminished. In other respects the eye was normal.

An interesting feature of this case was that in one eye the opacity was associated with an iridocyclitis with secondary glaucoma and blindness, whereas in the other eye, aside from the opacity, the eye appeared normal. From this it was difficult to say what was the sequence of events in the first eye. Possibly in this eye the opacity was secondary. In the second eye it would appear to be a senile dystrophy.

According to Fuchs this is the most common of the corneal dystrophies. He recognizes two forms, one secondary to destructive iridocyclitis and glaucoma, the second as a senile primary corneal condition. He has also observed it resulting from the long-continued impact of fine forming particles against the cornea.

The opacity begins near the limbus on either side of the cornea in its lower third and progresses toward the middle so that the portions toward the limbus are always more extensive and at first the central part of the cornea may be uninvolved. Under magnification it is found to consist of minute dots lying beneath the epithelium, the latter often being shagreened. Histologically the opacity consists of minute calcareous particles. Where these are the densest there is new formed connective tissue which may either extend toward the surface, causing the unevenness of the epithelium seen clinically or posteriorly, breaking through Bowman's membrane.

Examination of First Draft Men.

CAPTAIN BURTON CHANCE presented the resumé of his study of men of the National Army assigned to Camp Jackson, Columbia, S. C., published in full p. 318.

DISCUSSION.—Dr. Hansell said that the examination of the eyes of registrants by him, as a member of the Advisory Board of the Jefferson Hospital, had been difficult by reason of his desire to comply with the rules governing acceptance or rejection and his own ideas of the needs of the Government. The rejection of men whose vision was less than 20/100 and 20/40 meant the loss of many men who were eligible for almost any branch of the service. The Advisory Board was requested to assign men for selective service, yet the rules for the standard of vision absolutely prevented any choice by the board. No provision was made for the *careful* examination of men and so they were unable to tell in many cases whether vision could or could not be improved to the standard. The standards were entirely too high. If the Advisory Board was to have any selective power, and if the Board was made up as it was supposed to be, of experts in the various lines, the Board itself should set the standards. For example, a man is to be rejected because he has a progressive ocular disease: vision so bad that he can only earn his living as a laborer; an infectious disease; recurring inflammation and the possibility of sympathetic ophthalmia; or may become invalided because of his eyes. All others should be accepted either unconditionally or for selective service.

Dr. Posey said that as an officer of one of the local draft boards since the commencement of the war he was satisfied that the visual standards as now laid down by the Government were excellent, and that a soldier could not possess safely less than 20/100 vision in each eye, for with a lesser degree of visual acuity it would be impossible to escape accident in many situations in which a soldier would necessarily find himself. He called attention to the fact that there were no specialists

among the medical examiners of local boards, and that the Government had appointed the Medical Advisory Board for all kinds of special examinations. The oculists on such boards must be prepared to weed out malingerers, and in case of need to bring the vision in one of the eyes to 20/40 as per instructions from Washington. The work, then, of the medical advisory boards was of the greatest importance and could not be underestimated.

J. Milton Griscom, M. D.,
Clerk.

COLORADO OPHTHALMOLOGICAL SOCIETY.

March 16th, 1918.

Dr. David A. Strickler, presiding.

Penetrating Eye Injury.

Dr. W. F. Matson presented Mr. M., age 28, locomotive engineer. He was struck in the right eye, November 6th, last, while splitting kindling. There was a punctured wound of the cornea, iris, and anterior lens capsule, and a traumatic cataract subsequently.

A great deal of lens debris appeared in the anterior chamber from time to time following this injury, but the lens had not been needled and there had not been any elevation of the tension. Atropin and dionin had been used locally.

Discussion.—Dr. Wm. C. Bane saw this case shortly after the injury and he was pleased to see the improvement since that time. He stated that Dr. Irvine, of Salt Lake City, and others use the keratome for making an incision at the upper limbus, then after the keratome has entered the anterior chamber they turn the point into the lens. Following this they irrigate the lens capsule with normal saline and wash out all of the lens debris.

Irrigation of Anterior Chamber.

Dr. Bane exhibited an irrigator which he had made for this purpose. He used this in a man, age 27, shown at the February meeting of this Society.

Discussion.—Dr. E. T. Boyd said he irrigated the anterior chamber often. He uses the Teal tip bent at a 45 degree angle. He makes a keratome incision 5 to 7 mm. long before using the irrigator.

Dr. F. R. Spencer stated that he used a large douche can and a flat tip curved on the flat, as this answers all the requirements and avoids the expense of some special piece of apparatus.

Dr. E. R. Neeper said he used a syringe with a long glass tip bent at an angle of about 20 degrees.

Corneal Ulcers.

Dr. Edgar F. Conant presented Mr. W. F., aged 52½, ranchman, subject to rheumatism for 27 years. Denied syphilis and gonorrhea. However, six years ago and again last year he had small corneal ulcers O. D. In February and August, 1917, he had large central corneal ulcers O. S. The first one healed without perforation, but the second perforated. On March 8, 1918, he consulted Dr. Conant, at which time his symptoms were dimness of vision, photophobia, purulent conjunctivitis, and more or less deep pain in O. S. Examination revealed purulent conjunctivitis and a dense cataract in O. S. with an irregular pupil and posterior synechia. There was no increased tension O. U. The patient had used atropin at his home from time to time since last August. V. O. D., counted fingers at ten feet, and this was not improved by lenses. V. O. S., L. P. only. Given the usual silver nitrat and argyrol treatment for his conjunctivitis. Later this was changed to zinc solution without material benefit. The pain was much less severe when he used powdered dionin and atropia. However, the photophobia persisted. The pus from the conjunctival sac had not been examined bacteriologically.

Discussion.—Dr. E. R. Neeper said he would have the accessory sinuses examined by a competent rhinologist and a roentgenologist and he would also have a competent bacteriologist examine the pus from the conjunctival sac and from the tear sac. He believed that much of the pus was coming from the tear sac.

Dr. E. T. Boyd said this patient reminded him of his case of posterior lenticular opacities, in which neither

sugar nor albumin were found by the family physician. Later he had an expert laboratory diagnostician examine the urine and sugar was found.

Dr. F. R. Spencer said he had all cases of pus from the conjunctival sac examined bacteriologically as a routine.

Eye Injury.

Dr. Wm. C. Bane presented Mr. C. T., aged 20, with the following history: On March 2d he was struck on the left eye with a snow ball and knocked down by the blow. The vision of this eye was disturbed and marked swelling followed the injury. On March 7th, V. = L. P. There was marked congestion of the orbital tissues, and hyphema. Atropin caused pain and increased tension. Eserin relieved the pain and reduced the tension (by palpation) equal to that of the fellow eye. At the time of the meeting the light perception was good and the blood had disappeared from the anterior chamber. A view of the fundus was not obtainable, presumably on account of intraocular hemorrhage.

Discussion.—Dr. Geo. F. Libby was reminded of a patient who had been struck with a snowball. The tension was elevated; there was pain; and a rupture of the choroid was found at the macula, with blindness, when the vitreous cleared up enough to make the examination. Atropin was used and the tension became elevated. The pain increased. When eserin was used the pain subsided and the tension became normal.

Dr. W. H. Crisp referred to an elderly Jew whose condition he had reported at a former meeting of this society, in whom the atropin was used and the tension became elevated with an increase in pain. When the eserin was used the pain disappeared. The lens was found in the vitreous chamber later.

Dr. Edward Jackson said the lens was back of the pupil in Dr. Bane's case although it may have been eccentric. There was a poor nasal field for light projection and this may have been due to a clot, altho, of course, the retina may have been injured at this point.

Dr. E. R. Neeper said the atropin should have been used in spite of the pain, as the pain will disappear and the tension will become normal if the atropin is continued. He asked how much eserin and the percentage of the solution necessary to counteract atropin. These cases are sure to have pain the first 24 hours with or without atropin.

Drs. Aufmwasser and Spencer said eserin would have very little effect in counteracting the atropin the first 24 hours. But after that it will begin to have some effect. It takes much eserin to counteract the effect of a small amount of atropin.

Dr. E. T. Boyd said the elevated tension in these cases is relative. It is hard to detect this absolutely with the finger. The eserin, he believes, is rarely indicated, but it must be used often if we are to accomplish anything.

Dr. Bane said he did not see this patient until five days after the injury. The pain was very severe under atropin, so severe the patient could not sleep, but he could sleep after eserin was used.

Dr. E. M. Marbourg spoke of a case he had presented before this society in which the lens was forward and the tension elevated. Eserin was used to advantage. He believed the blood clots raised the tension temporarily.

Dr. E. R. Neeper said the iris was uneven. Possibly there were posterior synechias to hold the iris immobile, even if the pupil had been previously dilated.

Hole in Macula.

Dr. H. R. Stilwill presented a man, age 30, army recruit, who had been working as a fruit packer. Italian. V. O. D. 20/20; V. O. S. 20/100. There was a hole in the macula of O. S. with a great deal of choroidal pigment in and about the margins. He was struck in this eye with a rock several years ago.

Discussion.—Dr. Jackson said this may be classed as a hole in the macula, as in most cases there was no noticeable depth to these. All are pigmented.

He said there was not any appreciable depth to the fovea, yet it is deeper than the surrounding retina. This lesion was old and not progressive.

Dr. G. F. Libby said he noticed two glistening points which were probably due to cholesterin.

Entropion of Lower Lid.

Dr. Edward Jackson presented a man, aged 72, who had first been seen for a corneal ulcer of O. S. with entropion of the lower lid; the lashes of the middle third continually rubbed the cornea. In addition to treatment for the ulcer the lower lid was cauterized with caustic potash; the sharpened stick being drawn parallel to the lid margin and about 4 mm. below it until the skin turned brown. After more than five years, the lid margin remained in good position with the lashes well everted. The rounded, thickened, lid margin, due to the original trachoma which had become cicatricial before the patient was first seen, caused an eversion of the lower punctum which required slitting to admit tears to the canaliculus. O. D. was almost useless from haziness and irregularity of the cornea.

Congenital Dislocation of the Lenses.

Drs. Melville Black and E. T. Boyd presented Mr. T. D. with congenital dislocation of lenses. V. O. D. 20/200-20/70 + 11. sph. V. O. S. 20/200 = 20/100 + 11. sph.

Discussion.—Dr. F. R. Spencer said these lenses were less eccentric than in his patient presented before this society in March, 1911.

Dr. W. H. Crisp suggested an iridectomy above in both eyes and later needling of the lens if necessary to improve the patient's vision.

Dr. Jackson said if you could get absorption of the edge of the lens in the pupillary area you would certainly improve this patient's vision. Such lenses are difficult to needle, as they usually move easily. However, an operation may be indicated. If the lenses are well fixed he wouldn't operate. Extraction of these lenses might be better than needling, but this too would be difficult.

Exophthalmos Due to Ethmoidal Disease.

Dr. E. E. McKeown presented Mrs. J., who had been troubled with her eyes for the past twenty-five years and a short time ago O. D. became a great deal more prominent than O. S. Takes cold easily and had slight amount of watery discharge. Her physician said that she was apparently healthy. Teeth all out.

O. D. more prominent than O. S. by 5 mm. O. S. more prominent than normal. No increase of tension in either one. Pupils reacted to light and accommodation. The veins, O. D., seemed to be enlarged, but no diminution in the size of the arteries. O. S. seemed to show more redness in the center of the disc than normal. This may have been from a hemorrhage. Macular region apparently normal. Two pigment deposits on the temporal side of the disc. Examination of the nose revealed many polypi.

Discussion.—Drs. Marbourg and Spencer said they were able to palpate a firm tumor mass at the upper inner angle, O. D.

Dr. Edward Jackson said Graefe's sign was present O. U. However, O. D. showed this more markedly. He was surprised that the patient had not shown any symptoms of exophthalmic goitre. He was unable to feel what he thought to be a tumor mass.

Dr. H. R. Stilwill had been able to palpate such a mass.

Iridocyclitis.

Dr. D. A. Strickler presented Mrs. W., aged 25. She appeared for treatment August 28, 1917, with a history of having first noticed irritation and inflammation of O. D. six weeks before with a sensation of a foreign body in the eye. She was in the hospital from Wednesday until Saturday, three weeks before, with doubtful improvement. At the time of the meeting, there was a broad, bluish red, deep pericorneal injection, more marked above and to nasal side; pupil slightly dilated; media cloudy; photophobia; tenderness over ciliary body; and sensitiveness to motion. The pain at night

kept her awake. Atropin and Japanese hot box were used locally and byronia internally, with almost immediate relief of pain, redness, and tenderness. September 19, 1917, she returned with only slight pericorneal injection, at which time was first noted punctate keratitis together with pigmentation of anterior lens capsule (remains of posterior synechiae). V. O. D. 20/100 = 20/20 + 0.75 ⊂ +2.25 ax. 80. V. O. S. 20/40=20/20+ with + 1.00⊂+0.50 ax. 90.

On Nov. 26th, she reported that the eye had been free from inflammation until two days before, when it suddenly became red, but not painful. Vision with glasses 20/20 O. U.

On December 28th, she again reported with an inflamed eye and an increase in the punctate keratitis. Finding no evidence of focal infection in the nasopharynx, the teeth were X-rayed with a diagnosis of root abscesses of the right upper bicuspids and molars. Their removal was accordingly advised and performed with no apparent improvement by January 18, 1918, when she again appeared. At this time a positive Wassermann was found and antiluetic treatment instituted. In all, six intravenous treatments of neosalvarsan were given together with mixed treatment. Descemet's membrane was well dotted thruout, but vision with correction remained 20/20.

On February 18th, she reported that the eye had been much worse. Vision with correction 20/70 with central corneal opacity from coalition of deposits on Descemet's membrane. The complement fixation for gonococci was negative. Wassermann slightly positive. Von Pirquet positive. The urine (catheterized specimen) was loaded with staphylococci, pneumococci and colon bacilli. A marked leucorrhea with some cervical erosion was found, but no gonococci. She had become discouraged and objected to the mercury, as the gums were sore, when it was decided to direct the treatment against the bladder and vaginal disease, together with the K. I. She has made definite improvement in every way since. V. 20/30.

Discussion.—Drs. Crisp and Libby each spoke of the pigment over Descemet's membrane and the fact that the patient had been so much better since having treatment for the bladder and uterus. Dr. Crisp suggested the advisability of further treatment, if necessary, and perhaps mercury later.

Dr. Edward Jackson suggested the advisability of giving tuberculin later if she does not continue her improvement.

Tuberculous Scleritis.

Dr. H. R. Stilwill made a subsequent report on the case of tuberculous scleritis shown at the February meeting of this society. He stated that the Wassermann was negative and the complement fixation test for Gc. was also negative. The tuberculin test was positive.

Eye Injuries.

Dr. E. E. McKeown reported two cases: One, a boy struck in the eye with a piece of wood who was unable to close the lids. The second boy was struck by a rooster's beak and the sclera was perforated so that the vitreous ran out of the wound.

Wood Splinter in Orbit.

Dr. E. M. Marbourg reported a boy with a piece of wood ½ by $\frac{1}{16}$ in. between the eyeball and the lower lid for two weeks. This came out easily. There was very little reaction and a good result.

Frank R. Spencer,
Secretary.

WILLS HOSPITAL OPHTHALMIC SOCIETY.

Meeting of May 6, 1918.

Retinitis Proliferans.

Dr. William Zentmayer said that this condition is of extreme interest and importance, because of the still unsatisfactory status of the etiology of many of the cases of vitreous hemorrhage which occasion it, and because of the very unfavorable prognosis. In the cases of relapsing vitreous hemorrhage in juveniles the bleeding occurs in two forms, which often present themselves in opposite eyes of the same individual: one, as a massive hemorrhage

which diffuses itself thruout the vitreous and prevents light reaching the fundus; and the other, as multiple retinal hemorrhages which gradually escape into the vitreous.

It is probable that there are several causes for the hemorrhages; tuberculosis, syphilis, gout and endotoxins, diabetes, etc. Other factors, some related to, and others independent of these general causes, are blood pressure and alterations in the blood affecting its coagulability. The latter conditions are inconstant. In some cases the blood pressure is low, in others high. In some cases the coagulability is too rapid, in others too slow. According to Collins the coagulability is raised and this leads to the formation of thrombi in the venules which rupture as the result of the vis a tergo.

Oguchi studied the development of so called retinitis proliferans experimentally in rabbits by injecting blood into the vitreous. He found that the blood was removed from the eye partially by way of the central vascular canal. The greater part, however, was disintegrated in situ and taken up by migratory cells, which originated from the ciliary processes and the connective tissue network of the papilla; and subsequently traveled in part to the papilla and in part to the inner surface of the retina. The mechanical irritation caused by these cells resulted in glial hyperplasia of the retina, together with a migration of retinal pigment. He concludes that true retinitis proliferans arises from a connective tissue formation derived from the perivascular tissue of the papilla. There must be contact of the vitreous hemorrhage with the surface of the papilla.

Suguwuma, from anatomic studies and experimentation, concludes that the new-formed tissue comes from the glial fibres of the retina, as well as from the connective tissue subsequent to the hemorrhage; and believes that in all probability it may exist without prior vitreous hemorrhage,

According to Collins and Mayou, the steps of the process are as follows: if the coagulation of the blood is high coagulation takes place more rapidly than usual and absorption takes place slowly. The corpuscles discharge their hemoglobin, the stroma is broken up and cholesterin is formed. The fibrin either is absorbed or organizes. The endothelial cells from the blood vessels spread into the vitreous and bands of connective tissue form.

Dr. Zentmayer has recently observed the following cases:

CASE 1. Male. Age 18. (This case has been previously reported in brief.) Thoro physical examination was negative. The von Pirquet test was negative. The blood coagulation time was normal. When first seen in February, 1917, the left eye had light perception. The vitreous was so opaque that no reflex was obtained from the pupil. The right eye had nearly normal vision, and there were numerous hemorrhages in the retina in the region of the ora serrata. By September, 1917, the vision in left eye was nearly normal, and vision in the right eye 15/150. At the present time, V. O. D. = 15/100 and V. O. S. = 15/10. In the right eye there are dense fibrous bands, forming a complicated network with new blood vessels throughout the vitreous. He has recently had an attack of epistaxis.

CASE 2. E. B. Female. Married. Age 33. (Patient of W. T. Shoemaker.) First seen in May, 1917. Vision, O. D. 20/50, O. S. 1/100. In the right eye there was marked proliferating retinitis. In the left eye the vitreous was filled with hemorrhage. The vision of the right eye had fluctuated greatly, but there had been practically no change in that of the left eye up to the time of using fibrolysin in January, 1918. The Wassermann was negative. No record of tuberculin test can be found. Blood pressure, 115 systolic and 65 diastolic. Coagulation time 12 minutes. X-rays of sinuses and head negative.

CASE 3. M. S. Female. Age 53. Single. V. O. D. Fingers at 1 meter. V. O. S. = 20/50. Vision has been failing for one year. Has been under treatment for diabetes for past 2½ years, and has gangrene of one toe. In the right eye there is typical retinitis

proliferans and in the left eye retinal hemorrhages.

CASE 4. A. S. Male. Age 23. Seen in consultation with Dr. P. H. Kleinhans, in April, 1918. V. O. D. 1/60. V. O. S. 15/30. In the right eye the central and lower part of the vitreous was so dense with newformed tissue and hemorrhages that no reflex was obtained. In the left eye there were many retinal hemorrhages in the peripapillary region. The young man was in good health. Physical and laboratory tests negative. Constipated. No epistaxis. Coagulation time normal. One brother supposed to have died of phthisis.

In the first two cases the treatment was much the same. Iron, potassium iodid, or the syrup of iodid. The effect of treatment was uncertain as under treatment one eye improved while the other grew worse, in two of the cases closely observed.

In the second case, because of the failure of the left eye to improve while the right eye continued to fail, it was decided to try fibrolysin. As the patient lived at a distance, it was deemed expedient also to use every other method which offered any hope at the same time. This made it impossible to assign to any one agent the credit for the slight improvement which resulted. Twelve doses of 2.3 cc. of fibrolysin were given in the course of one month. At the same time subconjunctival injections of salt and dionin were used. At the end of that time V. O. D. = 15/50 and V. O. S. = 1/200.

It will be seen that in these three cases there has been no constant finding in the physical examinations. The Wassermann was negative in all. The tuberculin test was positive in one, negative in one, and in one not recorded. Blood pressure was normal in all cases. The coagulation time was normal in two cases and slow in one case. In one case the cause was undoubtedly diabetes.

The treatment should be especially directed to proper living, and particularly to ventilation and food. Drugs should be given according to indications. No remedy is at present known which will arrest the cause of the hemorrhages. The one drug which seemed to give the best results was the iodid of iron in large doses. Fibrolysin is worthy of further trial.

Enucleation Under Local Anesthesia.

DR. WM. M. SWEET exhibited a man with recurring attacks of iridocyclitis whose left eye was removed under local anesthesia, a cardiac condition preventing the use of ether. The anesthesia was secured by the injection, in the region of the optic nerve, of a one per cent solution of novocain, with five minims of adrenalin solution, 1-1000, to each dram. A half curved needle, somewhat shorter than that recommended by Siegrist, was passed along the lower border of the external rectus muscle to the back of the globe, and about two drams of solution injected. The needle was then withdrawn and passed below the internal rectus, and the same amount of solution injected on the nasal side of the optic nerve. In a few minutes the eyeball became proptosed and the conjunctival vessels empty. About five minims were then injected at the point of insertion of each of the recti muscles. There was no pain at any stage of the operation. After removal of the globe, a gold ball was implanted in Tenon's capsule.

HAROLD W. HOW, M. D.,
Secretary.

PHENOMENA OF NEUROBIOTAXIS IN THE VISUAL APPARATUS.

C. U. Ariens Kappers,

AMSTERDAM, HOLLAND.

Abstract translation by Edmond E. Blaauw, M. D., Buffalo, N. Y., of an address delivered in honor of the Twenty-fifth Anniversary of the Netherlands Ophthalmological Society, June 9th, 1917. At the International Congress of Medicine in London, August, 1913, Prof. Kappers brought before the Section on Anatomy and Embryology his views regarding neurobiotaxis, the grouping of cells in the most efficient functional combinations by their displacement in the direction of a source of stimulation. The present address illustrates his views by consideration of the nuclei concerned with ocular movements and the arrangement of retinal elements, and gives a rational explanation of the cell groups in question.

Since the discovery of the phenomena of taxis and tropism they have kept the interest of the investigators. Especially since the eighties we have a number of observations which have been of value for our understanding of the forces which exercise a determining influence on the forms, movements and acts of the organism.

The world seemed interwoven by a mystery of force lines previously unknown, which help in building up life and direct it as a passive object, which is only a product of its surroundings in its growth and action. In the beginning not rarely it was overlooked, that life itself has its OWN forces and that this in many instances determined why now this force exercised the greatest influence, now this form or direction and then its reverse was produced by one and the same influence.

Quite early these tropisms were considered in the mutual organization of the different cells in a living organism; and it is now just 25 years since S. Ramon y Cajal's brilliant investigations have appeared. He was the first who realized that very distinct tropistically acting factors influence the texture of the nervous system. His opinion was based on embryologic material. He supposes different chemical secretions as factors for the tropisms during the embryologic development of the nervous system. Later he asserts, that this chemotactic hypothesis cannot give an explanation of the facts. He made, however, a suggestion, which seemed of greater significance than his chemotactic doctrine, of greater significance than even Cajal himself realized, namely: his observation "that, when a sensible region of the brain, after a period of rest gathers a new number of axis cylinders and receives a new group of excitations the cells strengthen their connection herewith in a double way, either by sending out a new dendrite, or by a displacement of their body self in that direction." Or, when an excitation center becomes enlarged, then nerve cells which are connected thru dendrites, can strengthen this connection thru a new dendrite, or by their own displacement toward it.

Kappers' own investigations began without knowledge of this sentence, and had brought him to the same conclusion, altho along other paths. The observations were made on grown-up material, and especially on the lower animals, the brain structure of which is simple and surveyable. They began with a surprise about the peculiar place, which the nuclei of the ocular muscles of some fishes have. The nucleus abducens in the codfish has a very ventral position, not far from the base of the oblongata. This position was found rather constant in bony fishes (teleosts). The relation in the sharks is entirely different. Here the nucleus lies in a very dorsal position.

The sixth nucleus seems in its most primitive condition in the Lampreys; it it is found to be included in a frontal cellular column, which lies in the anterior part of the oblongata; in which column also the trigeminus and facial nuclei lie. The nucleus lies here dorsal and before the seventh nucleus; and its root emerges with that of the trigeminus before the root of the facial.

The condition changes in the higher fishes in so far as the nucleus lies behind the exit of the seventh root, thereforefore is displaced backward in the region of the oblongata, where the nervus vestibularis enters and chiefly ends. The nucleus in the sharks takes a more caudal place than in the bone-fishes and has also a dorsal position, while in the bone fishes it lies on the level of the facial root, and takes nearly always a ventral place.

Of the two chief systems which influence the nuclei of the ocular muscles, the vestibular and the optic reflex systems, the first is the strongest in the sharks, which possess on account of this an enormously developed posterior longitudinal fasciculus. Numerous short and long reflex arcs originating in the vistibular end region of the oblongata pass in or next to the posterior longitudinal fasciculus, at the lateral side of which the abducens cells lie scattered, in these animals. Also the optical reflex arcs are well developed in the sharks and divide over the area of the above fasciculus and the base of the oblongata.

The last system: the socalled ventral tecto-bulbar tract takes gigantic dimensions however in the bony fishes. Moreover strong vestibular reflex arcs are present at the base of the oblongata in these animals. The dorsal vestibular reflex arcs are on the contrary in the bony fishes very little developed, much less than in the sharks. It is therefore not to be wondered at, that the ventral reflex arcs exercise a much stronger influence in the bony fishes. This appears as well from the ventral position of the nucleus, exactly on the ventral optic reflex arc, as from the fact that the abducens nucleus takes a more frontal position in the bony fishes than in the sharks. Which is in harmony with the frontal origin of these optical excitations and also with the fact, that the abducens nucleus in the plaices has a still more frontal position than in the other bony fishes, on account of the still stronger development of the fronto-ventral optical reflex arcs, in in these animals.

We find in the different representatives of the fishes a different position of the nucleus of the sixth nerve. Which finds its explanation in every special case in the stronger development of one of the chief reflex arcs for the ocular movements. In the sharks the enormous developed organ of equilibrium with its dorsal reflex arc; in the bony fishes the strongly developed ventral optical system.

For all animals higher than the fishes the dorsal position of the abducens nucleus is the rule. Among the amphibians this is not so striking in the frog, because here the posterior longitudinal fasciculus is separated from the bottom of the fourth ventricle by a rather considerable layer of cells. The sixth nucleus however lies here also against the fasciculus.

The abducens nucleus still lies very caudal in the amphibians, and even reaches the ninth root, showing thus a great resemblance with the sharks.

In the crocodiles the nucleus begins in its dorsal position to shift forward. demostrated as a frontal elongation of the nuclear column. The posterior pole of the sixth nucleus keeps at first its caudal position, which gives the nucleus a greater length but less compactness. In the land-living reptiles, the birds and the mammals, the posterior part of the nucleus moves forward, which makes the abducens nucleus more compact and shorter, it being located just before the position of the seventh root entrance.

The cause of the successive frontal displacements is probably the location of the frontal part of Deiters' nucleus and of the dorsal vestibularis nucleus, which form the chief reflex centers for the sixth nucleus in these animals. This is also demonstrated by the dorso-lateral position, which the abducens nucleus occupies in most mammals. Only in the carnivora, cetacea and insectivora a location is found directly next to the posterior fasciculus, and under the horizontal seventh root. In all other mammals the nucleus is moved dorso-laterally, and nearly forms one whole with the dorsal vestibular-nucleus. This lateral displacement results in the seventh nucleus lying not more be-

low, but at the side of the horizontal seventh root.

The phylogenetic consideration of the places taken by the sixth nucleus shows most clearly, that its topography is determined by the strongest stimuli which excite the nucleus; they are different in different animals and these differences show us neurobiotaxis as an important factor in the building up of the nervous system. This described phylogenetic frontal displacement is repeated in the ontogenesis, as demonstrated for bird and human embryos.

The shiftings of the nucleus trochlearis are not less evident. In the lamprey this nucleus lies above the fourth ventricle in the base of the cerebellar origin, the velum cerebelli, in which in the higher animals the decussation of its root bundles still takes place; and it comes much nearer the trigeminus than the oculomotor nucleus. In the higher fishes the nucleus is already located below the bottom of the fourth ventricle; and much more frontal, nearly back of the oculomotor nucleus, often before the exit of its own root, at a great distance from the trigeminus root.

This is the position in nearly all higher animals. Rarely transition stages are found, between a dorsal position as in the lamprey, and the usual subventricular location of the other animals. A position more or less between the dorsal and subventrical positions is found in Varanus Salvator, a desert lizard, and a transition from the caudal to the frontal position of this nucleus is found in some primitive amphibians appearing as a frontal elongation, when the posterior pole remains in its old place, as happens also with the abducens nucleus. Even in man sometimes a caudal remainder of the trochlearis nucleus is found as an isolated symmetric group of cells behind the chief mass.

The dorsal position of the trochlearis nucleus in the cerebellar velum in the lamprey may be the result of the numerous and partly crossing primary and secondary fibers of the equilibrium system there halting, while the subventricular position in the other animals is so that it lies on the posterior longitudinal fasciculus, the same reflex arc which determines in most other animals also the place of the abducens nucleus. That it moves also in the frontal direction is the result of fibers in this bundle, which originate from the roof of the midbrain and supply it in front with light stimuli. These last stimuli are much more important in the higher animals than in the lamprey. This has a poorly developed optic nerve and its tectum opticum is not much more than a simple ependym membrane.

In the sharks and bony fishes this tectum opticum is very strongly developed, and sends a large mass of reflecto fibers backward, also to the nucleus of the oculomotor and trochlearis. This produces also intimate cooperation of the trochlearis with the oculomotor nucleus, so that both groups in some animals can only be separated with difficulty, and in some animals (birds) even shift partly over each other. Therefore, here also are very remarkable nuclei transplacements, which can easily be explained by a tropism, a taxis, dependent on the stimuli which pass thru the functionating nervous system.

The largest of the eye muscle nuclei, that of the oculomotor, shows very important topographic differences, and differences in the relative relation of the groups of nuclei; which can be explained along neurobiotactic lines, The nucleus, which originates in all animals in the midbrain, because it innervates the first head myotome, does not show frontal or caudal displacements of great significance, being from the beginning in the center of the optical system, but rather shiftings in the dorso-ventral plane. It contains only two groups of cells in the lamprey, the frontal part of which lies entirely latero-ventral, directly at the spot where the root leaves the basis of the midbrain. Another part, somewhat more caudal, lies much more dorsal. A ventral oculomotor nucleus is not found in sharks; the entire complex of cells lies above and between the coordinating reflex path of these animals, the

posterior longitudinal fasciculus, the same as the trochlearis and abducens nucleus are grouped along this bundle, which is so mightily developed in the sharks.

As the abducens nucleus in the bony fishes has a very ventral position so also is a part of the oculomotor here shifted ventrally. This lies near the midline; and it is probable that it produces the small number of crossed rootfibers. This ventral displacement went in the direction of the ventral tectobulbar paths, collaterals of which can be followed in the nucleus, an influence therefore analogous to that exercised by the tecto-bulbar tracts on the abducens nucleus in these animals. Higher than the fishes the oculomotor nucleus in its entirety lies again in the direct surrounding of the posterior longitudinal fasciculus.

In some amphibia a very primitive distribution is present; in the reptiles it is clearly separated into tolerably sharp groups, and in some representatives of these animals is seen the well circumscribed small cell accessory nucleus of Edinger Westphal; this acquires in birds large proportions, perhaps in connection with the rather strong development of the inner ocular muscles. In general the grouping is strongly pronounced and the crossed rootfibers have become more numerous. The genesis of these crossed rootfibers in birds can be demonstrated to be due to a shifting under the influence of the stimuli, which reach the cells. Crossed germ cells originate thru a migration of neuroblasts thru the raphe.

In the higher mammals the oculomotor nucleus undergoes very particular changes, which are related to the development of binocular vision and the interaction of the convergence and accommodation. The central nuclear group of Perlia, which has to do with the convergence, and lies in the raphe, is seen as a well defined group for the first time in the carnivora, and originates seemingly thru a conglomeration of a part of the root cells of the rectus internus, the convergence muscle. This group shows a displacement in the frontal direction in the anthropoid apes and especially in man. So that it then lies between the cell groups of Edinger Westphal, which regulate the intrinsic eye muscles and thus the accommodation. We see here clearly demonstrated, that the stimuli which lead to convergence, provoke a correlated complex of reflexes in the nuclei of both recti interni, and also produce a correlated arrangement of the cells, which are associated with that reflex; and thus originates the central convergence nucleus of Perlia, at first caudal in the niveau of the internal rectus nucleus. The frontal displacement which this convergence nucleus successively shows and which causes it in the end to lie in the same niveau as the intrinsic eye-muscles nucleus is the expression of the fact that convergence is correlated with accommodation.

These shiftings and different arrangements of the cells from which the nerves of the ocular muscles originate demonstrate clearly the phenomenon of neurobiotaxis, and demonstrate that the different positions of these nuclei depend on the stimuli which they receive, and that the cells migrate toward the place of the maximal stimulation. Because the eye is originally a photostatic organ which has nothing to do with perception of images and photostatics and gravistatics are the two most important and always correlated space-coordinates of life, it follows that next to the optic reflex fibers the fibers of the equilibrium system have such a remarkable influence on the position of the nuclei of the eye muscles.

As a third determinant the musclesense is added, which has a center in the roof of the midbrain.

While in the lamprey the roof of the midbrain apparently is found as sole ending of the optic nerve, in the sharks a lateral cell-group appears in the posterior part of the fore-brain, which is the homologue of the lateral geniculate body. This nucleus, at first small and receiving only a small part of the optic radiation or collaterals, enlarges slowly in the phylogenesis and takes up a con-

stantly increasing part of the optic nerve. So that at the end in man the greatest part of this nerve ends here, and only a smaller part reaches the roof of the midbrain.

In the lamprey a group of cells was found below the anterior margin of the roof of the midbrain, which does not have the lateral location, which we know of the geniculate cells; but the dendrites of which have grown strongly toward the periphery, and have contact with collaterals coming from the opticus, where this passes along the sideface of the forebrain. The lateral optic nerve nucleus is not yet formed but there is a decided contact thru dendrites of still medially situated cells and the formation of an external geniculatum nucleus finds place probably by the cell body following the dendrites, until a nucleus is formed situated against the optic nerve. We have here a new and well studied case of neurobiotaxis. The factors which come in play during the further increase of this nucleus as a terminal station of the optic nerve, and why the roof of the midbrain in itself takes up constantly less fibers, cannot be explained causally.

When an excitation center forms or increases in importance special cells will send out dendrites in the direction of that center or move themselves in that direction.

This is very clear, for instance, in the ventral displacement of the motor nuclei of the jaw and gill muscle in the direction of the gustatory tracts in fishes where the taste sense has reached an important development. These enlarged gustatory systems have not the slightest influence on the nuclei of the ocular muscles. Conversely if, as in the sharks, the posterior longitudinal fasciculus—a tract for optical and vestibular reflexes—enlarges, then the nuclei of the ocular muscles become influenced in their position but not the nuclei of the gill muscles. There is in the displacement of the cells a very distinct selection. Comparative anatomic investigations in lower animals convince, that this selection happens so that outgrowths and displacements only take place between elements which form a correlative functional connection.

The peripheric functional correlative connection between ocular muscles and light stimuli, gills and taste; or the relation of the stimuli at the periphery of the body determines and precedes the central fibers' connection. The neurobiotactic correlation in the central nervous system is a sequence of the relation of the stimuli with respect to the body. Often simultaneous stimuli in or on certain parts of the body of the animal will produce a material connection in the central nervous system. It is not amazing that this postulate was found, as we know since centuries thru psychology, that the correlated (simultaneous) stimuli educate our representative life, and the entire education, thru study, rests for not a small part on association.

The chief law of psychology, the significance of correlated stimuli for the building up of our mentality appears therefore to possess a formative significance; and is at the same time the chief law of the doctrine of neurobiotaxis. What the introspection, the inner experience of human life had taught already for centuries, can also be seen in the anatomic phenomena of that life.

After this law was found for the dendrites and the cell body, it was investigated to see if it also plays a determining role during the growth and the definitive distribution of the effectoric parts of the neurones—the axones—which form the plurality of the longer cerebral tracts. A careful comparison of beginning and end stations of such tracts shows that between these outgrowths a correlative relationship can be demonstrated, that a simultaneous or directly successive excitative condition exists between the region, from where the axon emerges and the region where it shall end; and that the relationship forms the cause for their course and explains a number of peculiarities in the end station of such paths, such as that central motoric tracts as the pyramids, do not stop originally in motor but in sensory re-

gions. It also explains, why no pyramidal fibers from the cortex end in the direct surroundings of the nuclei of the ocular muscles. Sensory posterior roots of the nuclei of the ocular muscles do not exist, and the principal sensory field corresponding with their function is the tectum opticum (anterior corpora quadrigemina) where the cortical efferent fibers for the nuclei of the ocular muscles end.

We learn thus as the chief law of neurobiotaxis, that *all anatomic connections originate between stimulative correlated centers.* Where the tropism of the impression-taking-dendrites goes toward the center of the impressions, thus is stimulo-centripetal, while the course of the axones, conducting further the impression, corresponds with the stimulus-current. The axon does not conduct at first an excitation originating in the nervous system, but on the contrary, this stimulus forms the axon. Young neuroblasts, which lie along the posterior longitudinal fasciculus in the chick embryo, begin only then to send out an axon, when this bundle has reached the level in which they lie. They are activated to send out an axon by this bundle. As this bundle does not touch them, it is clear that the excitations which radiate from the unmyelated axis-cylinders activate them. Herewith corresponds, that the axis-cylinder grows in a direction corresponding with this radiation; that is perpendicular to the fasciculus, and turned away from it, and that the activation takes place corresponding with the direction of growth, that thus the proximal neuroblasts are first and most activated into axonal growth. The perpendicular position of the collaterals is also a sequence. The end point of these new axones or collaterals becomes now determined thru regions stimulatively related to it. Connections of the roots with special muscles groups can be explained in this way. It may be said, that in all processes of neurobiotaxis the time-relation of the peripheric excitations plays a fundamental role, that the formative force proceeds from these excitations, and that the dendrites and later the cell body grow towards an excitation center, and the axis cylinder away from such a center. This dynamic polarisation of the neuron is difficult to explain.

(We find in the first development of the stimulo-fugal axones the consequence of the anodo-tropic character of its protoplasm furthered by its high alkalichlorid condition; while the much later formation of the dendrites, which take up the stimuli, and the displacement of the perinuclear protoplasm in that direction, is an excitation-seeking tropism which probably becomes stimulated by the formation of the Nissl's bodies.)

The sensitive nerves, the cell shifting of the ganglion of Scarpa in the modiolus, and the peculiarities in the organ of smell are now considered from the neurobiotactic standpoint. . . .

The inward displacement of the placode cells is most evident in the light placode cells and appears very early, directly with the folding in of the cerebral wall. This is not so strange as light is one of the strongest tropistic factors, which can influence even thru the body wall. The light placode —the origin of the neuro-epithelium retinae—will not lose anything of its functional activity as light perceptive organ.

With the folding in of the cerebral vescicle and the growth deep in of the other placodes, we first think of a negative neurobiotaxis. To explain causally the origin of the retina in the cerebral wall, we have to find the reasons, which make a negative neurobiotaxis probable; and to find the correlation which makes the placode cells, when they move deep in, connect just with the cells of the central nervous system, and not with the origin of the eye muscles.

This happens already in Amphioxus, whose light cells lie in the spinal marrow. These cells belong to the first, which become invaginated, as they lie in the ventral midline, which folds in the first.

If we consider the fact of the ontogenetic origin of the light placode of

the vertebrates in the cerebral wall from a more general standpoint, then it is not so strange, as the negative tropism, the movement deep in the placode cells, is a general phenomenon, which is in the light placode only more evident than elsewhere. It happens often that later with the outfolding of the ocular vesicle in the direction of the light the negative tropism changes in a positive tropism and it is not strange, as then the skin excludes the direct influence of that medium.

A number of examples exist in the lower organisms, where an original negative tropism by itself—that is thru changes of the metabolism, which are proper to the individual itself—changes to a positive tropism; and in one and the same retina of the higher animals we see alongside of the stimulo-fugal light tropism of the older rods, the stimulo-petal tropism of the more recent cones, and the very strong photopetal tropism of the pigment.

The formation of pigment under the influence of the light is a very general fact. This pigment formation is not restricted to the eye, but is here exceptionally evident; and this in connection with the light perceiving neuroepithelium suggests there is a genetic connection between both these tissues, and that the light sense cells favor the formation of pigment. This is not surprising, as most animals acquire quickly a certain degree of phototropism and direct their eyes in preference toward diffused light.

A second phototropic process seems to favor the peculiar pigmentation of the eye. Light acts in two ways on organisms: directing and attracting or repulsing. Influence of the rays is the most potent factor in the adjustment of the organism; and it is possible to turn away animals, which otherwise seek the strongest light, from the stronger illuminated surface by specially directed rays, when they come in a less illuminated field, notwithstanding their positive phototropic character. An example of this is found in the eye as the orientation of the light perceptive elements takes place there to a great extent according to the rays which touch it, and it may be that this position of the cells according to the axis of the light is the cause that the tissue situated behind or between these cells undergoes a stronger influence of that light—also for the pigmentation. Not only, therefore, the directing of the eye itself at the light but also the directing of its percipient elements according to that light will be favorable for the pigmentation. It can not surprise, that not only parts of those neuroepithelial cells, as in many invertebrates and some vertebrates, but also of tissue behind these, as the retinal pigment layer of the mammals, and even the choroid, can undergo this influence. It is known that pigment, once formed by the light, also is attracted by the light, is positively phototropic.

A few words about the formation of the human eye. Of the different theories, which try to derive the eye from the lower forms, none is satisfactory. Comparing the eye of molluscs (snails, oysters, inkfishes) and that of the vertebrates, two groups which are certainly not related, we find such a similarity, that we are obliged to consider convergence-phenomena, rather than regular transitions. It is apparent looking for a causal explanation to think of the influence of the tropisms.

Considering the eye we find the outgrowth of a cerebral vesicle, which contains already the light cells on account of the strongly negative tropistic character of the young placode cells. During development the neuroepithelial layer and the posterior wall of the eye approach each other. This must not be considered, as if the ocular vesicle is first a hollow globe, which becomes impressed as a rubber ball into a double walled cup. It is an obsolete opinion to try to find the cause of this approachment in the lens. In eyes without a lens, as those of the Vermes, the neuroepithelium lies also against the pigment cells, as also in the hollow eyes of molluscs as the Haliotis and Nautilus. This proves that the lens is not necessary, as does the fact that in some vertebrates the lens is so small that it does not touch, in any stage of development, the neuroepithelium.

What then must be considered the cause of the approachment of the two walls of the ocular vesicle and what the cause of the growth of this double wall in hollow globe form? One could think of the photopetal character of the pigment, which accompanies a photofugal tropism of the rods, whose movements therefore are turned toward each other. There are however eyes, which contain preponderatly cones, and as the tropism of the cones at least of the myoid is photopetal, such an explanation could not be accepted, unless one surmises that their tropism had been photofugal in a young stage, which can not be excluded a priori, also if one considers the cones to be more developed rods, which, as the neuroblast in its further development, would reverse their tropism. Still another factor could be the influence of the light as position determining factor of the neuroepithelium.

If we accept that in ontogenetically or phylogenetically young animals a rather large part of the skin above the eye was thin and transparent enough to let the light rays through; and that this part becomes limited with a higher development of the skin, then the camera type without lens were present in the ocular *anlage,* as this also is found in the folded-in eye of Nautilus and Haliotis, and herewith the data for a reversed image-formation which accompanies a divergent direction of the rays.

It is evident that this divergent direction of the rays thru a narrow pupil according to the phenomena of phototaxis must cause a hollow-radial distribution of the neuroepithelium, which again from its side will favor a narrowing of the light-entrance.

This theory, to be correct, must be possible for all those cases where one relatively small, common entrance gives passage to the light for all neuroepithelium cells, thus for monoapertural eyes. This is so. Also according to this opinion no hollow eye will be found in those cases where no common entrance for all rays exists for all neuroepithelial cells, respectively, where each rhabdome has its own small light entrance, that is in the pluriapertural eye of the insects. The neuroepithelium forms and directs itself according to the course of the rays for each epithelial cell itself, which rays taken in their entirety are in relation to the animal's horizon. The eyes of the insect do not form therefore a bouquet of light tubes, because their basis, the head, is round, but because the vaulted visual field has this form. This also explains why there nearly always exists a rather important incongruity between the forms of their heads and their eyes, which last in most insects is much rounder than the head, the ocular implantation of which being sometimes totally flat.

Although we are far from the understanding of the richness of the surrounding life-forms, and although the results of many years of uninterrupted investigation and thinking are only suppositions, which have to be verified by others, and at their highest only symbols of the truth, still we feel that a mystery of force-lines works around us, which form life and direct it, and which we have to accept not as a wholly passive matter, but as beings in which the immanent equilibrium impulse, the actuality of life with its naturally reasonable correlations is a factor, which steers the body—insect, or man—"to make the best of it," however limited its visual field may be.

I thank you for giving me the opportunity to speak about material phenomena in the nervous system, some known for many centuries as conscious parallelisms as psychologic associations, because we notice them directly in ourselves.

Let us learn from this that this direct conscious experience reveals to us truths about life—more things, and quicker than the external phenomena demonstrates them to us, a truth with which Straub was very much impressed. The tropisms do not help to make us understand polar oppositions in the development of the tissue elements. It is more important that they explain the association, which contrib-

utes that these polar differences remain connected or become connected as one multiunit in rational connection.

Next to the brain no part of the organism shows us more clearly that natural reasonable connection, that logical character of the bodily development, than the eye in its formation and functionating accommodations. Herewith is illustrated the truth of the saying of Aristotle, the discoverer of the associations and the founder of psychobiology, repeated in different forms by later investigators, "parts of the soul are all found in every one of these bodily divisions; and they are like kind with each other and with the entire soul."

SHORT ABSTRACTS.

Important points capable of brief presentation are here noticed. The systematic review of current literature is to be found in the Digest of the Literature.

Maddox, Ernest E.—Close Versus Distant Illumination for Operations. (Brit. Jour. Ophth., Feb., 1918.) The writer praises highly a small addition to the conjunctival forceps for furnishing illumination during discission of "after cataract," and for emergency night operations. He attaches a tiny electric lamp to one limb of the forceps half an inch from the gripping end, attached with wire, the electricity required being furnished by an ordinary flash lamp. The bulb is so placed that it illuminates the iris brilliantly when the forceps are gripping the limbal conjunctiva, and the grip of the forceps ensures a perfectly steady light and maintains its distance from the cornea. This is better than attaching the lamp to the discission needle, since it is a mistake to attach a lamp to any cutting instrument held by the working hand, because the light not only moves with the instrument, but makes manipulation more cumbrous.

Since, in iridectomies and cataract extractions, the forceps are out of use during part of the operation, Maddox secures the advantages of close illumination in one of three ways: 1, an assistant holds the lamp on the same forceps; 2, the lamp is fastened to a nose-piece clipped on the patient's nose; 3, the lamp is attached to a thin metal disc fixed by plaster just above the patient's other eyebrow.

The writer contends that, in the absence of a condensing lens, the cornea is more brightly illuminated by a lamp of 2 c.p. at the distance of half an inch than by one of over 1000 c.p. at the distance of a yard, while with a condensing lens, we have to take into account the focusing of the filament on to one spot of the patient's retina by an approximately parallel beam of light which introduces an irritating element into the illumination quite out of proportion to its brightness.

Distant lights may have advantages in large hospitals, but Maddox believes that some form of close illumination has the following advantages: 1, greater economy; 2, greater portability; 3, greater kindliness to the patient's eye, since a close light is diffused widely over his retina with no possibility of the image of the filament being thereon; and 4, increase of the surgeon's visual acuteness, the smallness of the patch of light on the patient's eye causing far less chemical waste in the surgeon's retina than a widespread shine from the whole face and pillow.

C. H. M.

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NEUROBIOTAXIS.

A new idea generally requires a new word for its expression. At first it may be conveyed in a clumsy roundabout way by unfamiliar and awkward phrases. But when the new term has been coined and used enough to make it familiar, the expression of the idea becomes more clear, direct and brief. The best of such words are built up from those words of older languages that carry related meanings.

Taxis means arrangement, or movement toward arrangement. Its most familiar application is to indicate the method of restoring by manipulation, the relation of the parts concerned in hernia. Taxonomy the development of science which embodies the principles of arrangement or classification; and chemotaxis indicating the movement of living cells in response to certain chemical stimuli are other familiar applications of this root word. The modern applications of the old Greek *bios* meaning life, are numerous and in common use. From these roots we get biotaxis, to indicate those arrangements, or movements toward arrangement of parts, that are determined by vital force. It is a very broad term corresponding in scope to attraction of gravitation or chemical affinity.

Neuron, a nerve, is the third root word used to form the term under consideration. In this connection it is well to think of neuron in its modern significance, as the primary unit of the nervous system, a nerve cell with its axon and dendrites, as expounded by Ramon y Cajal. It is used here to limit the term biotaxis to the special phenomena exhibited in the nervous system. From these three Greek roots the word "Neurobiotaxis" is built up. Prof. Kappers' presentation of the idea it was intended to convey at the London International Medical Congress was recognized as of most profound biologic significance and provocative of reflection rather than discussion.

Phototaxis, in a plant or some part of a plant taking a certain position with reference to the light falling on it, has long been recognized in botany; and more recently in zoology, especially in the movement of young fishes and other animals to or from the light. It is a vital manifestation more widely possessed and more primitive than any

form of the nervous system—an extremely important manifestation of the general irritability of living matter. In the higher forms of animals phototaxis is chiefly expressed as a form of neurobiotaxis, but in the original development of a nervous system protoplasmic irritability to light may well have played a part of primary importance.

The value of the conception of neurobiotaxis will be shown by what grows out of it. The location and relation of nerve centers and nerve tracts often seems extremely complex. Those, whose studies of the fundamental medical sciences were pursued chiefly before the modern conceptions of nerve centers had been worked out, find the mastery of these new ideas difficult. The old division of the central nervous system, by its gross external anatomic characteristics, is a serious obstacle to the full command of these later conceptions of it. It would be a real boon to the student to have some scheme of the central nervous system worked out on the basis of neurobiotaxis.

The essential physiologic functions exist in the simplest form of life, long before there is any appearance of any specialized anatomic structures to provide for their performance. It is certain that physiologic need has dominated the phylogenetic development of every organ. A grouping or classification of the various nerve tracts and centers strictly according to their physiologic relations would aid in understanding them and keeping in mind their functional significance. It would probably be quite valuable too as a basis for remembering their topographic anatomy. Kappers has effectively used the relations of the cell groups and nerve tracts concerned with vision to illustrate and support his hypothesis of neurobiotaxis. Who will take neurobiotaxis as a working hypothesis, and on it work out the scheme of anatomic grouping of these tracts and centers?

The gap between such a theoretic hypothesis and the practical questions of ophthalmic practice is not so great as might at first appear. The explanation of the case reported in this journal last month by Schwenk and Posey (see p. 393) rests on neurobiotaxis. The finding of an altered nerve cell in one of the deeper layers of the retina by Feingold (see plate III, Fig. 5) takes added interest when we come to study it in the light of neurobiotaxis. The phenomena of phototaxis and the chemotaxis of nutrition become of the greatest interest for the light they may throw on the internal movements of pigment cells, and their migration in conditions like retinitis pigmentosa and choroiditis. E. J.

THE WESTERN MEETINGS.

The meetings at New London this month, and at Chicago last month have given the oculists of the East and Middle West their opportunities for scientific discussion and renewal of personal associations; while keeping in healthy activity one of the most important influences making for professional efficiency, and the cultivation of patriotic enthusiasm. In the West the same opportunities will be afforded to the profession in the meetings at Denver, August 5th and 6th, and in Salt Lake City, August 12th and 13th.

The Colorado Ophthalmological Society will this year be joined by the Colorado Oto-Laryngologic Society in preparation for the Colorado Congress, and the program will include papers and discussions of interest to those practicing along both special lines. One evening will also be given to the subject of reconstruction and reeducation of the disabled soldier or sailor. It cannot be doubted that the success of the meetings already held this year has been due to the spirit of determination to "carry on"; and this determination is equally strong and prevalent in the West.

Some members of the Council of the American Academy of Ophthalmology and Oto-Laryngology had feared it was inadvisable to hold a meeting this year. With the President of the Academy in France, and the Secretary and other members of the Council in military service, and liable to be sent abroad

at any time, such a feeling was not surprising. But the meeting will be held; and the Western members will see that it is a success. As last year the program may be shortened to two days, but the interest and enthusiasm will not be lacking.

The meeting at Salt Lake City will be the farthest East that the Pacific Coast Oto-Ophthalmic Society has ventured. But it is an organization that has proved strikingly successful in gathering together the isolated special workers of the extreme West; and with a President and Secretary residents of the place of meeting, everything will done to make it a success. The trip between Denver and Salt Lake should be thought of as an added attraction, for those who will have the opportunity to make it; and the summer railway excursion rates from Eastern cities will be available for the whole trip, and as much additional vacation as one may be able to take.

E. J.

PROPRIETARY DRUG NAMES.

The medical profession has decried "patent medicines." But the registered names under which such drugs are advertised and sold are the property that yields the manufacturers their millions. Such proprietary names are also used for the new synthetic compounds with long unwieldy chemical names that are prescribed by the medical profession. Most of these have from time to time emanated from Germany, with a kind of literature that has proved an effective and profitable variety of propaganda; but which will henceforth be regarded with more skepticism.

The present impossibility of dealing with the German manufacturers of these drugs has forced the United States Government to intervene and recognize other names under which the same drugs are now being sold. The letters of Professor Puckner and Professor Stieglitz, published in this number under "Correspondence," call attention to some of these names under which we can now obtain drugs of especial importance in ophthalmic practice.

The time is auspicious for breaking away from the habit of using one set of these names that have been helping to draw heavily from the wealth of this country for the benefit of Germany. But a radical change in the laws regarding the proprietary rights attached to the registered names of drugs will be necessary, before the grave evils that have grown up around this practice can be wiped out.

E. J.

BOOK NOTICES.

Robert Henry Elliot, Lieut.-Colonel I. M. S. (retired). **GLAUCOMA. A Textbook for the Student of Ophthalmology.** London: H. K. Lewis & Co., Ltd. 136, Gower Street, W. C. 1918. Price 21s.

Elliot's monograph, which represents much labor and is written with remarkable clearness and power, should be read by every ophthalmic surgeon. In an introductory chapter it is insisted upon, that the word "glaucoma" is a convenient label for a large group of pathologic conditions, which have in common a rise in the intraocular pressure, upon which every sign and symptom of the disease depends. At the same time Elliot is emphatic upon the point that the glaucomatous process, however different it may appear clinically, is in root one and the same.

Chapter II takes up the subject of intraocular pressure and the tension of the eye. The physical conditions regulating that pressure and the bearing upon intraocular pressure of the continuous flow of fluid which occurs throughout life through the chambers of the eye are considered, together with those changes in the chamber pressure characteristic of certain forms of glaucoma.

He summarizes his conclusions as follows: (1) It is essential to bear in mind that in dealing with the physical conditions which govern the behavior of the intraocular fluid as it passes into and out of the eye, we have to do with

a body of moving water, and that the laws to which we must appeal are those of hydrodynamics, and not those of hydrostatics. (2) There are distinct tho slight differences of pressure at various points in the mass of fluid within the eye; the highest pressure probably lying at the area of production of the fluid, and the lowest, certainly, where it is excreted. (3) The above conclusions are borne out by the teachings both of physiology and of pathology. (4) The question whether the intraocular fluid is poured out by an act of secretion, or by a process of pressure filtration is still undecided. Probably the action is a combined one, pressure and secretory activity each taking a part therein. Fortunately, the interest involved is academic, rather than practical.

As regards the relationship of systemic blood pressure to intraocular pressure it may be said, speaking broadly, that the two rise and fall together. It would nevertheless be a mistake to suppose that the latter servilely follows the vagaries of the former. It is only by giving due weight to this point that we are able to reconcile the contradictory results obtained in experiments with amyl nitrit, adrenalin, strophanthus, and some other drugs. Elliot throws out the suggestion that in trying to estimate the importance of the part played by increased intraocular blood pressure, in affecting the pressure of the intraocular fluid, "we must look to the venous and not to the arterial end of the system." The author's conclusions as regards the systemic blood pressure and the intraocular pressure, and the relation between the intraocular blood pressure and the intraocular fluid pressure outside the vessels, are as follows:

(1) Whilst the systemic blood pressure tends, as it rises and falls, to exert a corresponding influence upon the intraocular pressure, this influence may be masked, or even wholly neutralized, by a number of other factors. (2) The high blood pressure of general arteriosclerosis is not necessarily, or even usually, associated with a high intraocular pressure, and is emphatically not a factor in the causation of glaucoma. (3) The venous exit-pressure thruout the eye must always be a little in excess of the intraocular pressure, if the circulation of blood is to be maintained. It is therefore very difficult to assume that the pressure in Schlemm's canal can be below that of the intraocular pressure, and that the channel is held open against a negative pressure by the rigidity of the structures which surround it, unless the same assumption is extended also to the veins which lead out from it. (4) It seems probable that osmotic action plays a large part in the transference of fluid from the anterior chamber into the canal of Schlemm and the iris veins, and that this action is strongly reinforced during the waking hours by the pump action described by Professor Arthur Thomson. The author, by the way, gives considerable prominence to the last named theory.

A chapter of upwards of sixty pages is devoted to the etiology of glaucoma. The author's endeavor has been to deal with the subject clearly, giving to each worker the fullest credit, but showing favor to no one. Priestley Smith's views are accorded the utmost deference. A feature of this chapter and of some others are the microphotographs taken by Mrs. Elliot. All the factors which have from time to time been cited as causes of glaucoma may ultimately be classified under one or other of two headings: (1) Those which influence the balance of secretion and excretion of the intraocular fluid, and (2) those which directly or indirectly determine a change in the vascular conditions within the eye.

Speaking of the pathologic anatomy Elliot does not lay any great stress upon the changes in the vortex veins described by Birnbacher and Czermak, and he regards evidences of vascular disease generally as more likely to be the result rather than as the cause of an increase of intraocular pressure. As to the cavernous atrophy of the optic nerve described by Schnabel, he points out (1) that it is met with in eyes that have never been subject to an increase in internal pressure, and (2) that no

signs of its existence are to be found in many, if not in most, glaucomatous globes. The most important piece of evidence that glaucomatous cupping is due to increased intraocular pressure lies in the fact, pointed out by Holth, Axenfeld, and Butler, that after the reduction of ocular tension by means of operation, the glaucoma cup may level up or completely disappear. In this connection it may be noted, too, that Lange has seen a diminution in the depth of glaucoma cups after the employment of miotics.

Fibrosis of the pectinate ligament as a factor in causation may be one of the causes predisposing to glaucoma, since it may tend to upset the balance normally held between the secretion and the excretion of fluid from the eye. Beyond this cautious statement Elliot is evidently not prepared to go. To Fischer's theory of the production of glaucoma by the action of acids or alkalies on the tissues of the eye Elliot opposes the fact that no anatomic evidence has yet been brought forward to prove such a change (edema) as he assumes. Neither has the result of treatment based on Fischer's theory always proved successful. In discussing the part played by closure of the filtration angle, the work of Leber, Knies, and Weber is spoken of, and a handsome tribute is paid to that of our own countryman Priestley Smith.

Chapter IV deals with the diagnosis of glaucoma. It insists upon the importance of a surgeon being on his guard; and teaches that while great difficulties undoubtedly occur, the majority of cases of glaucoma are readily diagnosed. Elliot considers that the term prodromata of glaucoma is a bad one, and that from the moment the earliest premonitory signs appear the eye should be regarded as definitely glaucomatous.

There are objections to the use of the term "absolute" as applied to glaucoma. For the purposes of the present book it was decided to adopt a classification into: (1) early glaucoma, (2) established glaucoma, and (3) late glaucoma. The scheme is at least useful, expressive, and logical. The signs and symptoms of glaucoma as it affects each structure of the eye are taken up in turn. On page 165 Elliot figures a very ingenious paper folding device intended to explain the edge of a glaucoma cup and the apparent alteration in the direction of the vessels as they emerge on the plane of the retina. The device should be found useful by students, who often misunderstand the apparent discontinuity in the course of the vascular trunks.

A most important section of chapter IV deals with the visual field in glaucoma, in the course of which the advantages and disadvantages of large and small test objects are discussed. To employ large objects is of no advantage, since it does not increase the size of the field, whilst it lessens the accuracy of the observations made. By reducing the dimensions of the object, we find that even in normal subjects the size of the field mapped out is considerably reduced, until when working with a 1 mm. object at a distance of 2 m. the field extends to about 20 mm. all round. From such a chart features of great value may be gathered which do not appear if a larger object be employed.

Elliot employs Sinclair's useful method of stating the size of an object as the numerator of a fraction, the denominator of which denotes the distance of the eye from the perimeter, and he insists that in all perimetric work it is necessary to state the size of the object, the distance of the eye from that object, and the illumination and the color of the object. Elliot thinks that the best results may possibly be secured in the end by the adoption of the electric-lit instruments. In connection with the distribution of the nerve fibre bundles on the retina, and its bearing on glaucomatous field defects we draw special attention to the original diagrams Nos. 29, 30, and 39. The study of these diagrams is most helpful. This section abounds with illustrations and those of Roenne, van der Hoeve, Bjerrum, and Sinclair are freely drawn upon to supplement the writer's own charts.

Elliot describes a new scotometer, and takes the opportunity of figuring a novel perimetric sign of glaucoma, which may be a development of Seidel's well known sign. On the assumption that Seidel's sign is due to an injury to the fibers of the optic nerve, either on the disc or at its edge, it has always seemed curious to Elliot that the scotoma in question should be described as ending in a pointed or rounded single extremity. It seemed more reasonable to assume that the peripheral limits of the scotoma would end not in one point but in several. This has been found to be the case when early glaucomatous eyes were examined with the author's new scotometer. Readings, however, must be taken all round the circle, at each point from 1° from the center out to 26°. After the relief of tension by surgical means the scotoma is much reduced in size, although its peripheral limits still possess a more or less ragged edge. The sign now described by Elliot may prove to possess considerable diagnostic value.

Speaking of the Schiötz tonometer Elliot says that "the feeling of those who work with it is that one might just as well guess a patient's temperature by passing a hand over his skin as attempt to estimate his ocular tension by the digital method alone." In using the instrument the author prefers to have the patient lying flat upon a bed, or on a comfortable couch, and in such a position that it is difficult for him to drop the chin. Before application the foot plate of the tonometer should be sterilized in absolute alcohol and dipped into warm water. In order to avoid the danger of corneal abrasion a drop of sterilized liquid paraffin should be used, and in all nervous patients local anesthesia should be secured by a drop of holocain, 2%. The eye should be fixed by looking at an object immediately above the couch. One application of the instrument made with care should usually suffice. The tonometer should be applied vertically, its footplate should rest as nearly as possible on the center of the cornea, and never on the sclero-corneal junction.

Elliot concludes that "though the Schiötz tonometer does not necessarily record the exact intraocular pressure given to Cridland's views as to its rather wide range. In brief, Elliot thinks it probably goes very near to doing so in the great majority of ordinary cases. The comparative readings which it furnishes of any one eye at different periods and under different conditions are absolutely reliable. Again, the instrument may be depended upon to detect with certainty very small differences between the pressures of the two eyes of the same person." The writer agrees with Priestley Smith in thinking that the actual reading given by the instrument should be recorded, and not the supposed equivalent in mm. of mercury.

In discussing the limits of the normal intraocular pressure prominence is given to Cridland's views. In brief, Elliot thinks that the great value of the Schiötz tonometer lies in watching the progress of a case and in observing the effect of the means employed to combat the rise of intraocular pressure. The author appears to believe that the examination of the light sense (for which purpose he has devised a special apparatus), may prove a fruitful field in the future, altho he is far from being dogmatic on the subject.

Altogether, Elliot has covered the diagnosis of glaucoma in a most satisfactory way. Running all thru the chapter is the insistence upon the need of taking a broad view of each case; and never being led into the mistake of forming a judgment upon one sign or symptom alone, however important that particular item may seem to be. When in doubt after a survey of all the evidence available, the surgeon's attitude should be one of watchful waiting.

The chapter which deals with congenital glaucoma and some allied conditions, as juvenile glaucoma, is most interesting. Once again Elliot insists upon the essential unity of all forms of glaucoma. If it were possible to judge all cases in the light afforded by full anatomico-pathologic knowledge, which is unfortunately not the case, we could

scientifically classify glaucomas into: (1) the congenital, i. e., those due to prenatal defects in the normal development of the excretory passages of the eye; (2) those in which the degenerative processes associated with senility play the leading part; and (3) those in which the anatomic configuration of the eye is such as to pave the way for the onset of glaucoma, with a minimum of assistance from the processes of senile degeneration. As to buphthalmos it probably always dates from birth, altho slight cases may not be recognized until later in life; so that not a few instances of so-called juvenile glaucoma are really of buphthalmic origin.

The signs and symptoms of buphthalmos are carefully described. Speaking of the tension of such eyes Elliot points out that owing to alteration in the curvature of the cornea, the Schiötz tonometer is unsuitable for recording the intraocular pressure. He comments upon the fact that in buphthalmos the myopia present is very moderate in amount. In the majority of cases the disease is due to a persistent fetal condition of the angle of the anterior chamber, as maintained by Collins and others. In a smaller number of cases intrauterine inflammation is responsible for the condition. It is probable, says Elliot, "that the main factor is the tendency to refective development, and that disease plays a subsidiary and comparatively infrequent part" (p. 338).

Megalocornea is regarded by the author as an instance of infantile glaucoma that has undergone arrest before permanent damage has been inflicted upon the eye. With regard to the treatment of buphthalmos a resumé is given of the subject and stress is laid upon the fact that whatever the nature of the treatment it should be begun early. The author has had some encouraging results from trephining, altho he is far from claiming invariable success from that or any other operation. In operating upon these difficult cases he points out certain technical matters, of which one is that the usual step of slitting the cornea is not needed. The essential factor of success, whatever operation be adopted, lies in the production of a filtering scar. The possible influence of congenital syphilis in buphthalmos must be borne in mind.

Chapter VII is devoted to a discussion of the medical treatment of glaucoma, taking up separately in the same chapter prophylaxis, the treatment of an established condition of simple glaucoma and of an attack of congestive glaucoma. In regard to the medical treatment of glaucoma the various means at our disposal are discussed, special stress being laid upon the employment of miotics, and of various kinds of massage. De Wecker's striking aphorism is quoted: "If miotics have never cured a case of glaucoma they have prevented many glaucomatous patients from being cured." If despite medical measures the disease progresses, Elliot is convinced that we should resort without further delay to surgical means for the production of a fistulous scar.

Chapter VIII deals with iridectomy in glaucoma, the first section being devoted to the opinions of the old masters and the second to those of more modern writers. In order to account for the curious discrepancy of view as to the value of the operation in glaucoma several points must be considered; such as the confusion in terminology, the different periods at which iridectomy is undertaken, and the technic of the operation. With reference to the last point Elliot claims that the "man who can perform iridectomy in congestive glaucoma easily, smoothly, and safely is a pastmaster of his art." Another important point in judging the effect of iridectomy in glaucoma has to do with the period during which the cases are followed after operation.

A glaucomatous process may be definitely checked by operation yet the surgeon's aim may be defeated by a progressive atrophy of the optic nerve, and in connection with this Elliot throws out the valuable suggestion that we should in all such cases seek out and treat all possible causes of autoinfection, inasmuch as a nerve damaged by intraocular pressure may be

liable to fall a ready prey to any toxic influence which it would under other and happier conditions have readily overcome. After pointing to the various ways in which an iridectomy reduces the tension of a glaucomatous eye, Elliot makes the point that in the newer operations we are dealing with an entirely different set of conditions; since the aim is not to reopen old physiologic channels, but to form a new and vicarious conduit for the escape of the aqueous. In those operations, he thinks, there can "be no question that a fistula can be established long after the time is past when an iridectomy would be of any avail." Again, arguments for the importance of early operation in iridectomy do not tell so much when dealing with the newer operations, although even under those circumstances the point is not to be belittled.

The author reaches the following conclusions: (1) If an operation for glaucoma is to be undertaken, the earlier it is performed the better is the result likely to be; therefore, it is important to make up one's mind on the subject at the earliest possible moment. (2) Every case of glaucoma in which operation is postponed should be watched with the utmost care, and the moment that medical treatment fails to hold it in check, surgery should be resorted to without delay. (3) Special watch should be kept on (a) the condition of the visual field, (b) the tension and (c) the visual acuity. A departure from the normal in all three or in any one of them and especially in the visual field calls for a decompression operation. (4) Iridectomy, undertaken with the deliberate intention of freeing the natural channels of excretion and so of restoring the *status quo ante* should only be resorted to in those early cases in which there is reason to believe that such a feat is possible. Once plastic inflammation has blocked the angle of the chamber, this rôle of the procedure ceases. (5) When it is recognized that the attainment of decompression depends on the opening up of various filtration channels, the obvious call is for one of the newer operations. The fact that an iridectomy or a sclerotomy may be followed by the formation of a filtration scar is beside the point. We should deliberately undertake a well planned procedure which aims at the formation of the kind of scar we desire to produce. Any other line of action is bad surgery, since it lacks consistency and clarity of purpose. (6) Each surgeon must be guided not only by the environment of his patients but also by his own idiosyncrasies. (7) Each case must be considered on its own merits. The relative prospects of life and of remaining months or years of sight must be carefully weighed. Against the admitted dangers of operating must be set the inexorable progress and the appalling results of the disease. (8) Statistics are wanted both of success and of failure.

In bringing this notice to an end we congratulate Lieut.-Colonel Elliot upon having produced a noteworthy book in which the manifold problems of glaucoma are discussed in a broad-minded and logical way and in a thoroughly scientific spirit. It marks an epoch in the history of glaucoma.

SYDNEY STEPHENSON.

CORRESPONDENCE.

The British Society Meeting.

To the Editor: The 38th Annual Congress of the Ophthalmological Society of the United Kingdom met under the Presidentship of Mr. E. Treacher Collins, at the Royal Society of Medicine, London, from May the 2nd to the 4th, 1918.

The Proceedings were opened by the President's address, in the course of which he reviewed the work of the past year, and announced that "the Bowman Lecture would be delivered by our friend and ally, Professor Morax," and that the Nettleship gold medal for the year had been awarded for the first time to a physician, Dr. Gordon Holmes, in recognition of his work in connection with War Injuries of the Visual Centres.

The President then read a very valuable paper on "An experimental investigation as to some of the effects of

hypotony in rabbits' eyes." He had got Lt.-Col. Kirkpatrick in Madras to carry out the necessary procedures, and to send the eyes home ready for cutting. In some of the eyes the anterior chamber had been tapped, whilst in others the vitreous chamber had been trephined. At various short periods thereafter, the animals had been killed, and the eyes suitably prepared for sectioning. The most interesting feature in a paper full of suggestions was, that the situation and nature of the exudate varied according to the cavity, which had been opened. An interesting discussion ensued. (The papers then read are noticed under "Society Proceedings," p. 501.)

Mr. Freeland Fergus' paper on "Vision and Work" was taken as read in his absence. Excellent discussions followed the readings of the papers.

The afternoon was taken up with the discussion of "Plastic operations of the eyelids." This was opened in a very able and interesting paper by Major Gillies, R. A. M. C., from the Sidcup hospital, the work of which has become so famous. Messrs. Higgens and Harrison Butler followed him, and then a number of other surgeons took part. An important feature of the afternoon's work was the exhibition before the meeting commenced of illustrative cases and of models. The other business of the afternoon was the report of the Committee on "The conditions affecting the standards of vision in the British Army." Then followed the business meeting of the Society.

The official dinner at the Welbeck Palace Hotel in the evening was well attended, and was a very cheery function.

The following morning (May 3rd) the members of the Congress went down to visit the Metropolitan Asylums Board Ophthalmia School at Swanley in Kent, as the guests of the President; and spent a most enjoyable and profitable morning in going round these model schools and in seeing the working of the Institution. A discussion was held on the spot on "Contagious Diseases of the Conjunctiva." The Secretary read a very instructive communication by Major J. F. Cunningham and Capt. J. Wharton, R. A. M. C., on the work that had been done on this subject in connection with the Chinese and Egyptian labor battalions in France. The President then contributed a short but interesting paper on the work of the Ophthalmia Schools, and Mr. Mayou dealt with the pathology of trachoma, illustrating his subject by colored drawings. A good discussion followed in which a number of members took part.

After lunching with the President, the members returned to London and visited the Museum of the Royal College of Surgeons, where Col. W. T. Lister exhibited a large and most beautiful collection of specimens illustrating war injuries of the eye. The Congress reassembled in the evening at the Royal Society of Medicine, when a number of cases were shown, and papers were read.

On Saturday, May 4th, the place of meeting was at the National Hospital for Paralysis, Queen's Square, where a clinical meeting was held, and papers were read by Dr. Kinnier Wilson, Dr. James Taylor, and Mr. L. Paton.

An invitation to attend the Congress had been sent by the President to all medical officers serving with the American and Canadian Armies in Europe. Very few of them were able to attend; but those who did were made heartily welcome. Mr. Collins and the officers of the Society are to be heartily congratulated on the results of their efforts. It is no small achievement to hold any form of congress at the present time. They not merely held one, but made it a great success. Mr. J. B. Story of Dublin has been elected President for the coming term of office.

R. H. Elliot,
Lt.-Col., I. M. S., Rtd.

BLUE CATARACT.

To the Editor: I was glad to see a translation of the Blue Cataract paper in the last number of the journal. You may recall that I reported several of these cases in the *Ophthalmic Record* in 1913, under the title of "Unusual Types of Punctate Cataracts," but unfortunately in

the reference to this article in the Year Book of that year, page 193, no mention was made of my allusion to the greenish color of the opacities. I know that when I attempted to look up the American literature on this subject, I failed to find any that was satisfactory.

Yours very truly,

T. B. HOLLOWAY.

Philadelphia, Pa.

Names of Synthetic Drugs

To the Editor: Professor Stieglitz, Chairman of the Subcommittee on Synthetic Drugs of the National Research Council, has asked me to send you the enclosed letter for publication. (See below.)

On behalf of the Committee, he also urges that you adopt the Federal Trade Commission's recommendation to use the official name of the licensed drugs in connection with all written articles and advertisements, and if the proprietary brand name is to be used, to place this side by side with the official name.

The official names so far adopted by the Federal Trade Commission are:

Arsphenamin for the drug marketed as: Salvarsan, Diarsenol and Arsenobenzol, etc.

Neoarsphenamin for the drug marketed as: Neosalvarsan, Neodiarsenol and Novarsenobenzol, etc.

Barbital for the drug marketed as Veronal.

Barbital-Sodium for the drug marketed as Medinal and Veronal-Sodium.

Procain for the drug marketed as Novocain.

Procain Nitrate for the drug marketed as Novocain Nitrate.

Phenylcinchoninic acid for the drug marketed as Atophan.

Yours truly,

W. A. PUCKNER.

Chicago.

Procain and Novocain Identical

To the Editor: It appears that in certain quarters the attitude is taken that the local anesthetic sold as Procain is not identical with that marketed as Novocain. The Subcommittee on Synthetic Drugs of the National Research Council believes it important that this misunderstanding should be corrected and hence offers the following explanation:

The monohydrochlorid of para-amino-benzoyldiethyl-amino-ethanol, which was formerly made in Germany by the Farbwerke, vorm. Meister, Lucius and Bruening, Hoechst A. M., and sold under the trademarked name Novocain, is now manufactured in the United States. Under the provisions of the Trading with the Enemy Act, the Federal Trade Commission has taken over the patent that gave monopoly for the manufacture and sale of the local anesthetic to the German corporation, and has issued licenses to American concerns for the manufacture of the product. This license makes it a condition that the product first introduced under the proprietary name "Novocain" shall be called Procain, and that it shall in every way be the same as the article formerly obtained from Germany. To insure this identity with the German Novocain, the Federal Trade Commission has submitted the product of each firm licensed, to the A. M. A. Chemical Laboratory to establish its chemical identity and purity, and to the Cornell pharmacologist, Dr. R. A. Hatcher, to determine that it was not unduly toxic.

So far, the following firms have been licensed to manufacture and sell Procain:

The Abbott Laboratories, Ravenswood, Chicago.

Farbwerke-Hoechst Company, New York, N. Y.

Rector Chemical Co., Inc., New York, N. Y.

Calco Chemical Company, Bound Brook, N. J.

In conclusion: Procain is identical with the substance first introduced as Novocain. In the interest of rational nomenclature, the first term should be used in prescriptions and scientific contributions. If it is deemed necessary to designate the product of a particular firm, this may be done by writing Procain-Abbott, Procain-Rector, or Procain-Farbwerke or Procain (Novocain brand). Yours, truly,

JULIUS STIEGLITZ.

NEWS ITEMS

Personals and items of interest should be sent to Dr. Melville Black, 424 Metropolitan Building, Denver, Colorado. As these columns go to press on the 30th of the month contributors should send in their items by the 25th. The following gentlemen have consented to supply the News Item Editor with the news from their respective sections: Dr. James A. Black, San Francisco; Dr. V. A. Chapman, Milwaukee; Dr. A. E. Davis, New York City; Dr. M. Feingold, New Orleans; Dr. Wm. F. Hardy, St. Louis; Dr. George F. Keiper, La Fayette, Indiana; Dr. George H. Kress, Los Angeles; Dr. W. Holbrook Lowell, Boston; Dr. G. Oram Ring, Philadelphia; Dr. Chas. P. Small, Chicago; Dr. Geo. M. Waldeck, Detroit; Dr. Oscar Wilkinson, Washington. It is desirable that this staff shall be enlarged until every city of importance in the United States shall be covered as well as all foreign countries. Volunteers are therefore needed and it is hoped that they will respond promptly to this call.

DEATHS.

Dr. Addison F. Sanders, Cincinnati, was killed on May 5th by being struck by an automobile.

Neil J. Hepburn, aged 71, of New York City, died at his home May 28th.

Lt. Col. Frank C. Todd, formerly Prof. of Ophthalmology in the University of Minnesota, died July 4th at the Presbyterian Hospital, Chicago, from double pneumonia contracted while engaged on inspection duty.

CORRECTION.

Lieutenant J. W. Thompson, of Pueblo, Colorado, should have been on the honor list of ophthalmologists now in the service.

COMING MEETINGS.

Colorado Ophthalmological Congress, Denver, Colorado, August fifth and sixth.

Pacific Coast Oto-Ophthalmological Society, Salt Lake City, August twelfth and thirteenth.

PERSONALS.

Dr. J. P. McCullough, ophthalmologist and aurist to the British Forces from 1915-17, has opened an office in Toronto, Canada.

Col. W. T. Lister delivered the Hunterian Lecture on May 8th, on the subject of "Pathologic Aspect of Certain War Injuries of the Eye."

Dr. S. Lewis Ziegler of Philadelphia, at the recent meeting of the Alumni of the Medical Department of the University of Pennsylvania, was elected President for 1918.

Dr. Harold C. Goldberg, of Philadelphia, has been appointed Ophthalmic Surgeon to the American International Ship Building Corporation of the Emergency Fleet located at Hog Island.

Dr. E. Velter, Chief of the Laboratory of Clinical Ophthalmology of the Paris Faculty of Medicine, has been awarded the Chateau-Villard prize for his work on war surgery, "Penetrating Wounds of the Head by War Projectiles." This article had already received the Godard prize for 1917 of the Academy of Medicine.

Dr. D. F. Harbridge, of Phoenix, Arizona, has been elected Secretary of the Arizona State Medical Association. Dr. Harbridge was one of the delegates to the Conference of State Secretaries held in Chicago, at the call of the A. M. A., to supply medical officers for the Army, the immediate need being 5,000 doctors.

Dr. Clarence Loeb has been appointed Associate in the Eye Department of the Michael Reese Hospital, Chicago.

SOCIETIES.

Three candidates presented themselves for examination before the American Board of Ophthalmologic Examinations, in Chicago, on June 10th. Because of his confining duties in the Government service, Dr. Todd has resigned as Secretary of the Board, and Dr. Wilder was elected to succeed him.

The Chicago Ophthalmological Society gave a dinner on the evening of June 11th in honor of the visiting guests of the American Medical Association. Among the distinguished out-of-town visitors who responded to toasts were Doctors Howe of Buffalo; Zentmayer, DeSchweinitz, and Holloway, of Philadelphia; Weeks and Thompson, of New York; Calhoun, of Atlanta, and Parker, of Detroit.

At a representative meeting of ophthalmologists at the Royal Society of Medicine, it was decided to form a council to take action in matters of ophthalmologic interest in connection with public affairs. It was decided that the Council should consist of all the past and present presidents of the Ophthalmological Society of the United Kingdom, and the Section of Ophthalmology of the Royal Society of Medicine as permanent members, four members nominated annually by the councils of each of these societies, and one representative from the Oxford Ophthalmological Congress.

The Mexican Ophthalmologic Society has decided to publish its own annals, and the Anales de la Sociedad Oftalmologica Mexicana has already made its appearance. Dr. D. M. Velez is its director and the perpetual secretary of the Society. Summaries of the two leading articles are given in both English and French, and duplicates are published on an insert for convenience of reviewers. The officers of the Society for 1918 include Dr. F. Lopez, president; Dr. A. Chacon, vice-president, and Dr. E. F. Montano, perpetual treasurer.

At a recent meeting of the American Medical Association in Chicago, the Ophthalmological Section was, as usual, one of the best attended sections of the meeting, there being 407 registrants. The Chairman, Dr. Duane, of New York, was unable to be present. The vice-chairman, Dr. Calhoun, of Atlanta, presided.

One of the striking features of this section is that there are few attempts to speak other than to the question. Rambling discussions that have nothing to commend them are rarely

heard. The Section met in the ball-room of the La Salle Hotel. The room was much too large and the acoustic properties were bad. This feature is so important that it should be most carefully considered in each instance. The newly elected officers were, C. D. Wescott, Chairman; Thos. B. Holloway, Vice Chairman; E. S. Thompson, Secretary; W. B. Lancaster, Delegate; E. H. Cary, Alternate; Edward Jackson, Member of American Board for Ophthalmic Examination. The next meeting will be at Atlantic City.

MILITARY NOTES.

Charles W. Kollock, M. R. C., of Charleston, S. C., who was commissioned September 18th, 1917, is in charge of the Aviation Unit, Charleston, S. C.

Dr. James A. Smith of Chicago has been commissioned a First Lieutenant in the Medical Reserve Corps, and is waiting to be called to active duty.

Capt. Francis Lane of Chicago, who has been in charge of the ophthalmologic department at the base hospital, Camp Grant, has been obliged on account of ill health to retire from the Government service. He intends to resume his private practice as soon as possible.

The following ophthalmologists have been transferred from the M. R. C. to the National Army in order that higher ranks might be conferred upon them: Theodore Lyster, Brig. General, Aviation; Walter R. Parker, Colonel, N. A.; George E. de Schweinitz, Edward C. Ellett, Frank Todd, James Bordley, Jr., Nelson Nelson M. Black, Casey A. Wood, and Allen Greenwood have all been made Lieutenant Colonels in the National Army.

The *British Medical Journal* describes the ophthalmic motor ambulance given to the Italian army by the group of American poets. It was designed by Professor Busi of Bologna and Major Balestra, and the whole packs into a trolley of the dimensions required by the railway authorities. It provides a small operating room with wooden walls and roof covered with impermeable canvas, and a waterproof tent mounted on iron frames with rainproof roof. This forms the reception room and also on occasion a radiologic cabinet and ophthalmoscopic examination room when it is covered inside with black cloth. The *Riforma Medica* states that the ambulance has been completed and has already left for the front in charge of Major Alfonso Neushuler.

MISCELLANEOUS.

The Association Valentin Häuy pour le Bien des aveugles, 9, rue Duroc, Paris, has offered a prize of 1,000 francs for the best apparatus which enables the blind to read temperatures.

Members of the Hempstead Academy of Medicine, Portsmouth, Ohio, are petitioning the State Health Department for an appropriation to establish a Federal and State Trachoma Hospital in Portsmouth.

The Eleventh Annual Report of the Massachusetts Commission for the Blind has been submitted for the year 1917. The number registered during the year amounted to 2,007; special service being rendered to 1,046.

A number of acute illnesses marked by ophthalmoplegia and other symptoms suggestive of botulism have occured in London and in other parts of Great Britain. The cases are featured by double third nerve paralysis with ptosis and diplopia. Pyrexia and delirium have been present in most cases. The source of infection is obscure but is due to some kind of infected food.

The Hospitalstidende quotes a German exchange to the effect that an institution was organized in 1917 in Germany to train dogs to serve as guides for the blind. Dr. Bauer is in charge of the work, and he recently exhibited five dogs that had finished their training. They not only serve as guides but warn the blind man they are leading of every obstacle, watch out for anything he may drop, and, in short, it is said, serve as a friend and protector as well as a guide.

OPTICAL GLASS MADE IN AMERICA.

Ophthalmologists who have known something of the serious shortage of optical glass in this country will be interested in knowing how the situation has been met. The War Industries Board now authorizes publication of the following facts:

Optical glass, although not required in large quantities, is an item in war operations which is important because much of the firing, especially of artillery, is directed by optical instruments. If the men are not equipped with adequate fire-control instruments or can not see to aim properly, their firing can serve little purpose. A field army or a battleship without field glasses, telescopes, and other optical instruments is manifestly placed at a serious disadvantage.

Before the war little effort was made to produce optical glass in the United States. Manufacturers of optical instruments were able to obtain optical glass in desired quantity and quality from Europe and consequently did not feel the necessity for making it themselves. In 1912, however, the Bausch & Lomb Optical Co., of Rochester, N. Y., built an experimental optical glass plant and placed a practical glassmaker in charge; by 1914 this company was able to produce a few types of optical glass which were used in optical instruments.

By the end of 1914 the importation of optical glass had become difficult and uncertain. Other firms, as Keuffel & Esser, of Hoboken, N. J., and Spencer Lens Co., Buffalo, N. Y., and the Bureau of Standards of the Department of Commerce, at Washington, began to experiment in making optical glass. By 1917, when the United States entered the war, the optical glass situation had become critical. The European supply was practically cut off. Optical glass had to be made in this country if our Army and Navy were to receive the fire-control instruments which they needed.

The geophysical laboratory of the Carnegie Institution of Washington was called upon

to aid in the production of high grade optical glass. A party from the laboratory was stationed at the plant of the Bausch & Lomb Optical Company in April, 1917, and for seven months all efforts of the laboratory were concentrated at this plant. At the end of 1917 the essential details of the manufacture had been developed and glass in considerable quantities was being produced. The efforts of the laboratory were then extended to the Spencer Lens Company and to the Pittsburgh Plate Glass Company, Pittsburgh, Pa. During this period the Bureau of Standards rendered effective aid.

At the present time, as a result of cooperation between the manufacturers and scientists, large quantities of optical glass of the kinds needed for military fire-control instruments are being produced, and of a quality equal in practically every respect to the best European glass. The need for a continuance and assured supply of optical glass is so great that the workmen trained in the details of manufacture and subject to draft, are being withheld from draft, in order that their technical training may be utilized at this time. The required information and details of manufacture and the skill necessary for proper production have been gained at great expense and under high pressure.—*Official Bulletin War Dept., Friday, June* 21, '18.

DINNER TO DR. SAMUEL D. RISLEY.

Dr. Samuel D. Risley, the nestor of American Ophthalmology, after a notable career as professor and author has discontinued public work and will henceforth devote himself to the exacting demands of his private practice.

The occasion of Dr. Risley's retirement from Wills Hospital Staff—after twenty-seven years of unbroken service—marked an important epoch in American Ophthalmology, and was made the occasion of a testimonial dinner which was confined to ophthalmologists of the city of Philadelphia and the state of Pennsylvania, with a group of notable representative men of other branches of medicine and surgery.

The dinner was held at the Union League of Philadelphia, the committee in charge being Dr. Howard F. Hansell, Dr. William Campbell Posey and Dr. G. Oram Ring.

Dr. G. Oram Ring, a former student of Dr. Risley, acted as toastmaster and made appropriate reference to the honored guest, as author, teacher, companion and friend.

A letter was read from Major George E. de Schweinitz, who was prevented from being present by his work in connection with the Chairmanship of the Ophthalmological Section of the Council of National Defense. I quote a sentence from a letter of Major de Schweinitz read at the dinner:

"He steadied my feet when first they stepped into ophthalmic pathways, and because of his wisdom, advice and sterling example I have tried to walk straight. During many a trying hour, such as must come to all men who deal with the delicate and difficult problems of our profession, he has been my support and comfort, and he has never failed me as teacher, colleague, friend and exemplar. I am deeply grateful and proud withal that this debt is mine."

Dr. Charles K. Mills, a contemporary and life long friend of Dr. Risley, Professor of Neurology, University of Pennsylvania, spoke from the theme, "The Days of Auld Lang Syne."

Ex-Governor Edwin S. Stuart, as President of the Board of City Trusts, having in charge Wills Hospital, paid Dr. Risley an eloquent tribute in connection with his rare skill and devotion to the charitable work of the institution.

Dr. E. E. Montgomery, Professor Emeritus of Gynecology, of Jefferson Medical College, spoke upon the theme, "The Winter of Life."

Dr. P. N. K. Schwenk, as President of the Surgical Staff of the Wills Hospital, represented that body of Dr. Risley's colleagues.

Dr. Howard F. Hansell, Professor of Ophthalmology of Jefferson Medical College, represented the College of Physicians, of Philadelphia.

Dr. John B. Beaver, Professor of Surgery of the University of Pennsylvania, represented his branch of the profession.

Dr. T. Chalmers Fulton, spoke for the Medical Club of Philadelphia and paid a glowing tribute to Dr. Risley's administration as President of the Club.

Dr. William Campbell Posey on behalf of the guests presented Dr. Risley with a loving cup and paid a striking tribute to his work, particularly that on "School Hygiene."

G. O. R.

OPHTHALMIC LITERATURE.

Under this head continuing the "Index of Opththalmology" heretofore published in **Ophthalmic Literature** will be found the subjects of all published papers received during the last month, that bear to an important extent upon ophthalmology. The subject is indicated rather than the exact title given by the author. Where the original title has been in a foreign language it is translated into English. The journal in which the paper is published will indicate the language of the original.

The names of the different journals are indicated by abbreviations which generally correspond to those used by the **Index Medicus**, the **Journal of the American Medical Association**, and the **British Journal of Ophthalmology.** We will from time to time publish the list of ophthalmic journals, with the abbreviations used for each. Often a single letter discriminates between journals published in different languages. Thus "Arch. of Ophth." refers to the Archives of Ophthalmology, published in English; "Arch. d'Opht.," indicates the French Archives d'Ophtalmologie; "Arch. de Oftal." refers to the Archivos de Oftalmologia Hispano-Americanos, while "Arch. di Ottal." indicates the Italian Archivio di Ottalmologia.

In this index of the literature the different subjects are grouped under appropriate heads; so that all papers bearing on the same, or closely related subjects, will be found in one group. The succession of the groups is the same from month to month, and identical with that of the Digest of the Literature. Where a paper clearly refers to two subjects that belong in different groups, it will be noticed in both groups.

Each reference begins with the name of the author in heavyface type. This is followed by the subject of his paper. Then in brackets a number with (ill.) indicates the number of illustrations, or a number with (pl.) the number of plates illustrating the article, (col. pl.) indicates colored plates. (Abst.) shows that it is an abstract of the original article. (Bibl.) tells that the paper is accompanied by an important bibliography. (Dis.) means that the paper was read before some society and gave rise to a discussion which is published with it.

The "repeated titles" may render accessible the essential part of a paper, the original of which could not be consulted. These give (in brackets) after the author's name the volume and page of this department of "Ophthalmic Literature" where the title of the paper will be found; and then the journal, volume, and page where the translation or abstract is published.

It is desired to notice every paper as soon as possible after it is published. Readers will confer a favor by sending titles they notice have been omitted, with journal and page of publication; and of their own papers, sending either a copy of the journal in which each appeared, or a reprint. These should be sent as soon as possible to 318 Majestic Building, Denver, Colorado.

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